



FARRAGUT MUNICIPAL PLANNING COMMISSION AGENDA

November 19, 2020

7:00 p.m.

This meeting can be viewed live on the Farragut YouTube Channel, www.townoffarragut.org/livestream, Charter Channel 193, and TDS Channel 3." The meeting will be held virtually, authorized by Governor Lee's executive orders regarding the COVID19 pandemic.

Meeting comments may be emailed to comments@townoffarragut.org and must be received by 12:00 p.m. on November 19 to be included in the record of the meeting. Anyone that wishes to provide comments must include their name and address. For questions please e-mail Mark Shipley at mshipley@townoffarragut.org or Bart Hose at bhose@townoffarragut.org.

1. Approval of agenda
2. Approval of minutes – October 15, 2020
3. Discussion and public hearing on a re-subdivision plat involving nine lots in the Easton Park Subdivision located on the north side of Turkey Creek Road across from a portion of Anchor Park, Zoned R-3, 2.37 Acres (SITE, Incorporated, Applicant)
4. Discussion and public hearing on a final plat for the Ivey Farms Subdivision, Unit 1, Phase 1, located on the north side of Union Road, Zoned R-1/OSR, 6.26 Acres, 26 Lots (SITE, Incorporated, Applicant)
5. Discussion and public hearing on a site plan for a parking lot addition at the St. Elizabeth's Episcopal Church, 110 Sugarwood Drive, Zoned C-1, 4.54 Acres (Urban Engineering, Inc., Applicant)
6. Discussion and public hearing on a site plan for the property located at 13036 and 13038 Kingston Pike, Zoned C-1, 2 Acres (GBS Engineering, Applicant)
7. Discussion and public hearing on a concept plan for the Meadows on McFee, 933 and 1013 McFee Road, Zoned R-1/OSR, 32 Acres, 59 Lots (Homestead Land Holdings, LLC, Applicant)
8. Discussion and public hearing on a request to amend Appendix A – Zoning, Chapter 3., Specific District Regulations, Section XII., General Commercial District (C-1), B., 3., as it relates to the outdoor display and or storage of general farm implements and lawn care

11408 MUNICIPAL CENTER DRIVE | FARRAGUT, TN 37934 | 865.966.7057

WWW.TOWNOFFARRAGUT.ORG

It is the policy of the Town of Farragut not to discriminate on the basis of race, color, national origin, age, sex, or disability pursuant to Title VI of the Civil Rights Act of 1964, Title VII of the Civil Rights Act of 1964, and the Americans with Disabilities Act of 1990. If you are an employee of the town and are requesting accommodations due to disabilities, please call 865-966-7057 in advance of the meeting.

equipment, riding lawn mowers, and related accessories (Farragut Lawn and Tractor, Applicant)

9. Discussion on a rezoning of property situated around the eastern intersection of McFee Road and Boyd Station Road, Parcels 50, 50.01, 54.01, and 9.01, Tax Map 162, 12611 Boyd Station Road, from General Single-Family Residential (R-2) to Open Space Mixed Residential Overlay (R-1/OSMR), 131.25 Acres (OBO Homestead Land Holdings, Applicant)
10. Discussion and public hearing on a request to amend the future land use map in the Comprehensive Land Use Plan Update for a portion of Parcel 003.19, Tax Map 143 (a portion of the property referenced as 133 Concord Road) associated with the Farragut Town Center at Biddle Farms project from Medium Density Residential to Town Center (CHM, LLC, Applicant)
11. Discussion and public hearing on a request to amend the Farragut Zoning Map in association with the Farragut Town Center at Biddle Farms project, 11230 and 11240 Kingston Pike and 133 Concord Road, Parcels 3.02, 3.03, 3.10, and a portion of 3.19, Tax Map 143, from General Commercial (C-1) and General Single-Family Residential (R-2) to Planned Commercial Development (PCD), 43.63 Acres (CHM, LLC, Applicant)

12. Approval of utilities

13. Citizen Forum

Planning Commission Meeting Public Comment Protocol

The Planning Commission welcomes and invites Farragut residents to participate in public meetings.

At the end of each business meeting, there will be time reserved for public comment under the Citizen Forum agenda item. If you are interested in speaking, please fill out a blue comment card and turn it in to the Planning Director or other designated staff member. **For virtual meetings, comments may be emailed to comments@townoffarragut.org and must be received by 12:00 p.m. on the date of the meeting to be included in the record of the meeting. Anyone that wishes to provide comments must include their name and address.** This time is set aside specifically for comments on items that are not on the Planning Commission regular agenda for the meeting. Each speaker will be given five (5) minutes to speak on his/her topic.

During the regular agenda portion of the meeting there may be an allowance for public comment for each agenda item. The Chairman may recognize individuals for public comment based on the following guidelines.

1. The Chairman shall maintain and control the meeting to provide a professional and objective environment;

2. Any Farragut resident, property owner, or business owner interested in speaking should fill out a blue comment card stating which agenda item they would like to comment on and turn in to the Planning Director or other designated staff member;
3. Speakers shall come to the podium and identify themselves by name and street address;
4. Public comment shall be limited to five (5) minutes per individual. Time for public comment may be amended at the discretion of the Chairman. Time is not transferable to other speakers;
5. Speakers should strive to avoid redundancy; each speaker should have their own original viewpoint;
6. Comments shall address issues, not individuals or personalities;
7. Comments may support or oppose issues or measures, but the motives of those with differing views shall not be questioned or attacked;
8. Personal attacks and malicious comments shall not be tolerated;
9. An applicant, and/or their representative(s), for an item on the regular agenda shall be afforded the time necessary to present their request and respond to questions. The five (5) minute limitation shall not apply. However, the Chairman may ask an applicant to stay on point in order to facilitate the efficiency of the meeting.

Each speaker will be asked if they can agree to abide by the Comment Protocol. If so, please be prepared to speak when your name is called.



**MINUTES
FARRAGUT MUNICIPAL PLANNING COMMISSION**

October 15, 2020

MEMBERS PRESENT

Rita Holladay, Chairman
Ed St. Clair, Vice-Chairman
Ron Williams, Mayor
Louise Povlin
Scott Russ
Jon Greene
Betty Dick
Noah Myers
Michael Bellamy

MEMBERS ABSENT

Staff Representatives: Mark Shipley, Community Development Director

This meeting was conducted through a remote Webex session due to Governor Lee's orders and the Knox County Health Department's orders regarding the COVID-19 pandemic.

Chairman Holladay called the meeting to order at 7 p.m. and provided background on why the meeting was being conducted through Webex and where it may be viewed.

1. Approval of agenda

Staff recommended approval of the agenda as submitted.

A motion was made by Mayor Williams to approve the agenda as presented. Motion was seconded by Commissioner Povlin and motion passed 9-0 through a roll call vote.

2. Approval of minutes – September 17, 2020

Staff recommended approval of the minutes as submitted.

A motion was made by Mayor Williams to approve the minutes as submitted. Motion was seconded by Commissioner Myers and motion passed 9-0 through a roll call vote.

3. Discussion and public hearing on a request for a comcast cable line installation along the south side of Parkside Drive west of JCPenney and terminating at 11416 Grigsby Chapel Road (Fulghum, MacIndoe and Associates, Applicant)

Staff reviewed this item and recommended approval subject to the following conditions:

- 1) Please obtain a right of way permit from the Town and satisfy any field related requirements from the engineering staff;

- 2) Please restore any affected areas to their pre-construction condition and ensure that all affected areas are completely stabilized;
- 3) Please notify any affected property owners;
- 4) Please ensure that proper traffic control measures are in place; and
- 5) Please provide an as-built of the fiber installation to the Town once the project is complete.

After an initial motion and second was made, commissioners discussed this item and Commissioner Myers asked if a letter of credit should be provided similar to what has been required for some other recent utility projects. Based on feedback from other commissioners, a motion was made by Commissioner St. Clair to follow staffs' recommendation with the exception of adding as a 6th condition "Providing a letter of credit to ensure any disturbed areas are corrected with the dollar amount to be determined by the Town Engineer." Motion was seconded by Mayor Williams and motion passed 9-0 through a roll call vote.

4. Discussion and public hearing on a re-subdivision plat for the property located at 204 Boring Lane, Parcel 074.00, Tax Map 142, Zoned R-1, 7.57 Acres (Benjamin Moorman, Applicant)

Staff reviewed this item and noted that the applicant has requested a variance from the Subdivision Regulations to not construct a pedestrian facility along the Boring Road frontage. Staff indicated that separate action would be needed on the variance. Staff recommended approval of the variance due to the minor nature of the subdivision and the amount of frontage along which the pedestrian facility would be required. Approval of the variance would also be consistent with similar minor re-subdivisions on non-local streets that have been approved by the Planning Commission. Staff indicated that they have verified that a plat note has been added to indicate that the pedestrian facility requirement will be re-visited by the Planning Commission if any additional re-division of the property is proposed.

Commissioners discussed the variance request and Commissioner Myers asked that the location of the property be clarified by including a reference to the tax map and parcel. Staff indicated that this would be updated in the minutes. A motion was made by Commissioner Povlin to approve the variance for the reasons noted by staff. Motion was seconded by Commissioner St. Clair and motion passed 9-0 through a roll call vote.

Staff then recommended approval of the plat subject to obtaining required signatures.

A motion was made by Commissioner Povlin to follow staffs' recommendation. Motion was seconded by Commissioner Myers and motion passed 9-0 through a roll call vote.

5. Discussion and public hearing on a rezoning of the property at 933 McFee Road from Agricultural (A) to Open Space Residential Overlay (R-1/OSR), 7 Acres (Rackley Engineering, Applicant)

Staff reviewed this item and recommended approval of Resolution PC-20-15 which recommends approval of Ordinance 20-22.

A motion was made by Commissioner Povlin to follow staffs' recommendation. Motion was seconded by Commissioner St. Clair and motion passed 9-0 through a roll call vote.

6. Discussion and public hearing on an amendment to the Farragut Municipal Code, Appendix A., Zoning, Chapter 4., Section XXIX, - Grand Opening Special Events Permit, to provide for different sign related provisions (Town of Farragut, Applicant)

Staff reviewed this item and recommended approval of Resolution PC-20-16 which recommends approval of Ordinance 20-23.

Commissioners reviewed the item and Commissioner Bellamy asked that Section C., 8. be amended to change the phrase "good condition" to "same condition as issued." Staff and commissioners were in agreement with the proposed modification. A motion was made by Commissioner Povlin to approve Resolution PC-20-16 with the modification recommended by Commissioner Bellamy. Motion was seconded by Commissioner Myers and motion passed 9-0 through a roll call vote.

7. Discussion on a request to amend Appendix A – Zoning, Chapter 3., Specific District Regulations, Section XII., General Commercial District (C-1), B., 3., as it relates to the outdoor display and or storage of general farm implements and lawn care equipment, riding lawn mowers, and related accessories (Farragut Lawn and Tractor, Applicant)

For discussion purposes only.

8. Approval of utilities

None

9. Citizen Forum

Staff read into the record citizen comments that were submitted for items that were not on the agenda.

The meeting was adjourned at 9:04 p.m.

Scott Russ, Secretary

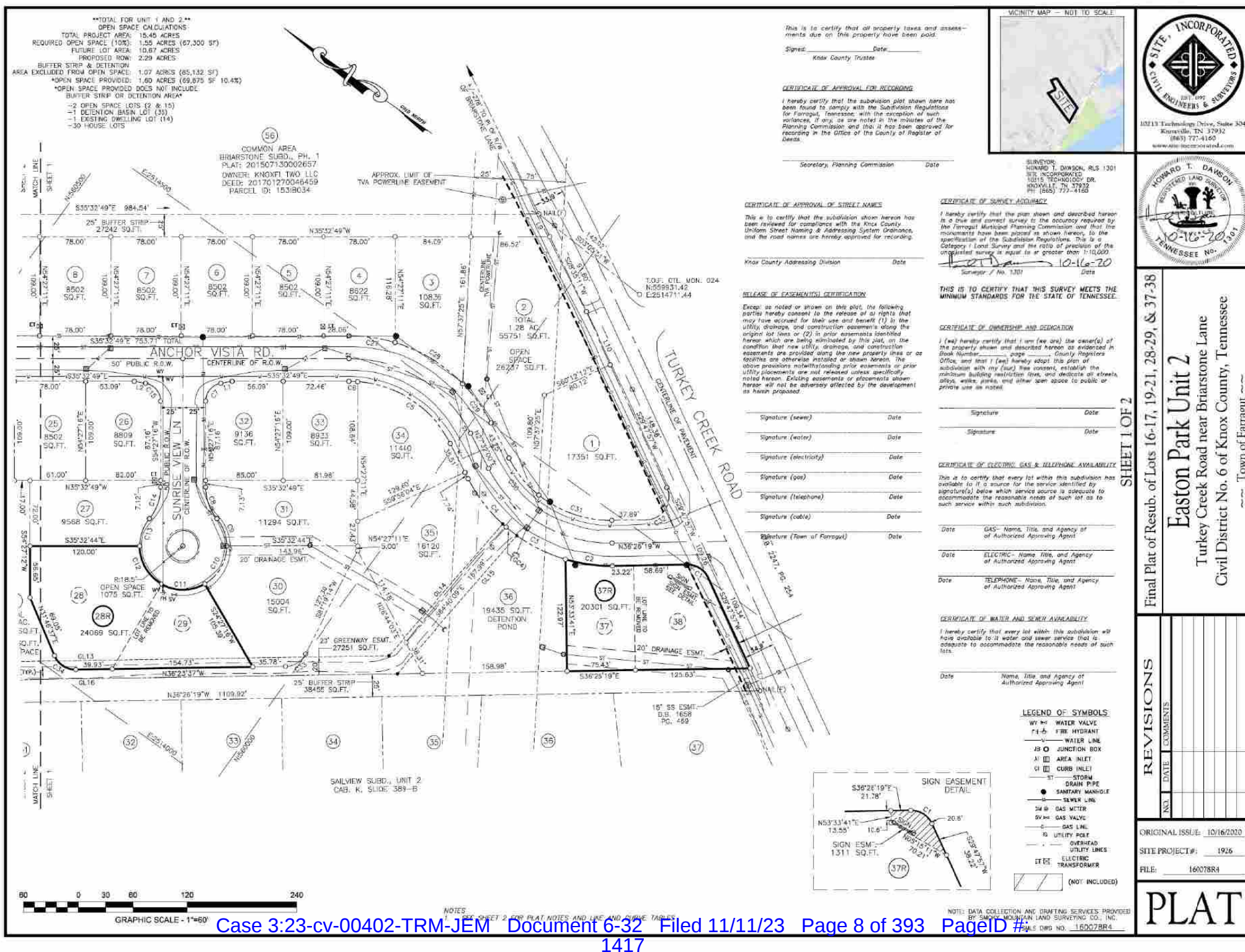
REPORT TO THE FARRAGUT MUNICIPAL PLANNING COMMISSION

PREPARED BY: Bart Hose, Assistant Community Development Director

SUBJECT: Discussion and public hearing on a re-subdivision plat involving nine lots in the Easton Park Subdivision located on the north side of Turkey Creek Road across from a portion of Anchor Park, Zoned R-3, 2.37 Acres (SITE, Incorporated, Applicant)

INTRODUCTION AND BACKGROUND: This item involves the re-subdivision/re-platting of nine (9) lots in Unit 2 of the Easton Park Subdivision. The nine (9) existing lots are being combined to form five (5) lots. The number of lots is being reduced to allow the developer to construct the remaining homes in the subdivision without residential fire sprinkler systems. Under the Town's current fire code, a subdivision with more than 30 lots and only a single point of ingress/egress must utilize residential fire sprinklers.

RECOMMENDATION: Included in your packet is the applicant's revised plat. Staff will make a recommendation at the meeting based on whether and how the applicant has addressed all initial staff comments.



****TOTAL FOR UNIT 1 AND 2****
OPEN SPACE CALCULATIONS:
TOTAL PROJECT AREA: 18.45 ACRES
REQUIRED OPEN SPACE (10%): 1.85 ACRES (67,300 SQ. FT.)
FUTURE LOT AREA: 10.67 ACRES
PROPOSED ROW: 2.29 ACRES
BUFFER STRIP & DETENTION AREA EXCLUDED FROM OPEN SPACE: 1.07 ACRES (85,142 SQ. FT.)
*OPEN SPACE PROVIDED: 1.60 ACRES (69,875 SQ. FT. @ 10.4%)
*OPEN SPACE PROVIDED DOES NOT INCLUDE:
- 2 OPEN SPACES (LOTS 12 & 15)
- 1 DETENTION BASIN LOT (33)
- 1 EXISTING DWELLING LOT (14)
- 30 HOUSE LOTS

COMMON AREA
BRIARSTONE SUBD., PH. 1
PLAT: 201507130000457
OWNER: KNOX TWO LLC
DCEB: 201701270046459
PARCEL ID: 15318034

This is to certify that all property taxes and assessments due on this property have been paid.

Signed: _____ Date: _____
Knox County Trustee

CERTIFICATE OF APPROVAL FOR RECORDING

I hereby certify that the subdivision plat shown hereon has been found to comply with the Subdivision Regulations for Farragut, Tennessee, with the exception of such variances, if any, as are noted in the minutes of the Planning Commission and that it has been approved for recording in the Office of the County of Register of Deeds.

Secretary, Planning Commission Date: _____

CERTIFICATE OF APPROVAL OF STREET NAMES

This is to certify that the subdivision shown hereon has been reviewed for compliance with the Knox County Uniform Street Naming & Addressing System Ordinance, and the road names are hereby approved for recording.

Knox County Addressing Division Date: _____

RELEASE OF EASEMENTS CERTIFICATION

Except as noted or shown on this plat, the following parties hereby consent to the release of all rights that may have accrued for their use and benefit (1) in the utility, drainage, and construction easements along the original lot lines or (2) in prior easements identified hereon which are being eliminated by this plat, on the condition that new utility, drainage, and construction easements are provided along the new property lines or as facilities are otherwise installed or shown hereon. The above provisions notwithstanding prior easements or prior utility placements are not released unless specifically noted hereon. Existing easements or placements shown hereon will not be adversely affected by the development as shown proposed.

Signature (sewer)	Date
Signature (water)	Date
Signature (electricity)	Date
Signature (gas)	Date
Signature (telephone)	Date
Signature (cable)	Date
Signature (Town of Farragut)	Date

CERTIFICATE OF SURVEY ACCURACY

I hereby certify that the plan shown and described hereon is a true and correct survey to the accuracy required by the Farragut Municipal Planning Commission and that the measurements have been placed as shown hereon, to the specification of the Subdivision Regulations. This is a Category I Land Survey and the ratio of precision of the unadjusted survey is equal to or greater than 1:10,000.

Surveyor: _____ Date: 10-16-20
Surveyor / No. 1301

THIS IS TO CERTIFY THAT THIS SURVEY MEETS THE MINIMUM STANDARDS FOR THE STATE OF TENNESSEE.

CERTIFICATE OF OWNERSHIP AND DESIGNATION

I (we) hereby certify that I am (we are) the owner(s) of the property shown and described hereon as evidenced in Book Number _____, page _____, County Registers Office, and that I (we) hereby adopt this plan of subdivision with my (our) free consent, establish the minimum building restriction lines, and dedicate all streets, alleys, walks, parks, and other open space to public or private use as noted.

CERTIFICATE OF ELECTRIC, GAS & TELEPHONE AVAILABILITY
This is to certify that every lot within this subdivision has available to it a source for the service identified by signature(s) below which service is adequate to accommodate the reasonable needs of such lot as to such service within such subdivision.

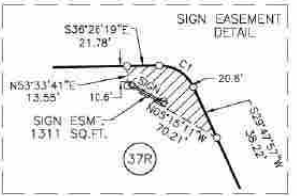
Date	GAS- Name, Title, and Agency of Authorized Approving Agent
Date	ELECTRIC- Name, Title, and Agency of Authorized Approving Agent
Date	TELEPHONE- Name, Title, and Agency of Authorized Approving Agent

CERTIFICATE OF WATER AND SEWER AVAILABILITY
I hereby certify that every lot within this subdivision is adequate to accommodate the reasonable needs of such lots.

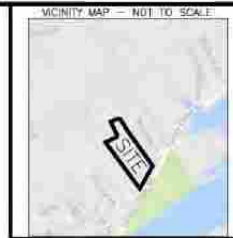
Date: _____ Name, Title, and Agency of Authorized Approving Agent

LEGEND OF SYMBOLS

- WY W WATER VALVE
 - F-H FIRE HYDRANT
 - W-L WATER LINE
 - J-B JUNCTION BOX
 - A IN AREA INLET
 - C IN CURB INLET
 - ST STORM DRAIN PIPE
 - S-S SANITARY MANHOLE
 - S-LR S-LR SINK LINE
 - SW S GAS METER
 - SV S GAS VALVE
 - G GAS LINE
 - U UTILITY POLE
 - O OVERHEAD UTILITY LINES
 - ET E ELECTRIC TRANSFORMER
- (NOT INCLUDED)



NOTES: DATA COLLECTION AND DRAFTING SERVICES PROVIDED BY: SAMPSON MOUNTAIN LAND SURVEYING CO., INC. SALS DWS NO. 160078R4

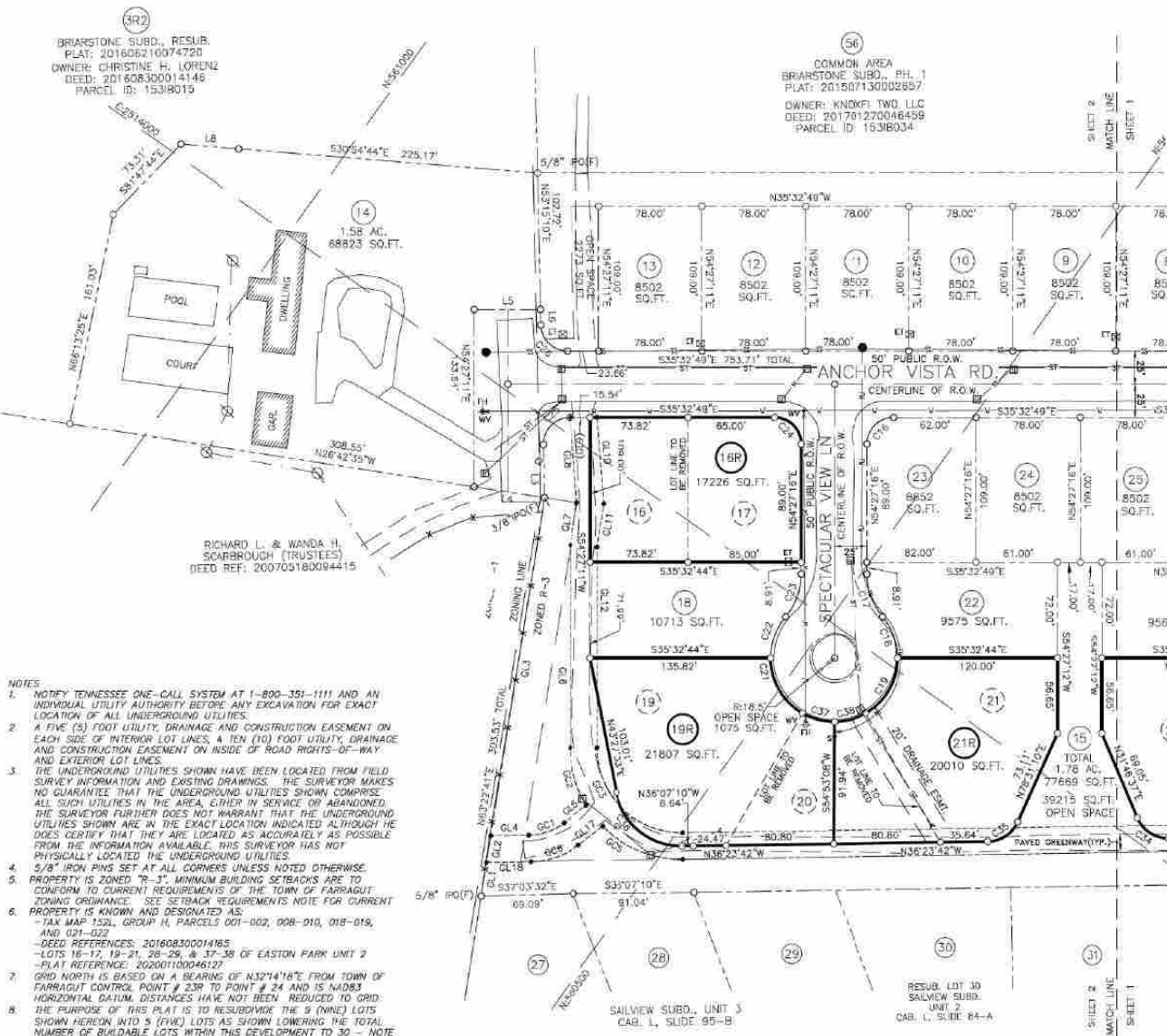


Easton Park Unit 2
Turkey Creek Road near Briarstone Lane
Civil District No. 6 of Knox County, Tennessee
Town of Farragut

REVISIONS	
NO.	DATE COMMENTS

ORIGINAL ISSUE: 10/16/2020
SITE PROJECT#: 1926
FILE: 160078R4

PLAT



- NOTES**
1. NOTIFY TENNESSEE ONE-CALL SYSTEM AT 1-800-351-1111 AND AN INDIVIDUAL UTILITY AUTHORITY BEFORE ANY EXCAVATION FOR EXACT LOCATION OF ALL UNDERGROUND UTILITIES.
 2. A FIVE (5) FOOT UTILITY, DRAINAGE AND CONSTRUCTION EASEMENT ON EACH SIDE OF INTERIOR LOT LINES, A TEN (10) FOOT UTILITY, DRAINAGE AND CONSTRUCTION EASEMENT ON INSIDE OF ROAD RIGHTS-OF-WAY AND EXTERIOR LOT LINES.
 3. THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THIS SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.
 4. 5/8" IRON PINS SET AT ALL CORNERS UNLESS NOTED OTHERWISE.
 5. PROPERTY IS ZONED "R-3". MINIMUM BUILDING SETBACKS ARE TO CONFORM TO CURRENT REQUIREMENTS OF THE TOWN OF FARRAGUT ZONING ORDINANCE. SEE SETBACK REQUIREMENTS NOTE FOR CURRENT REQUIREMENTS.
 6. PROPERTY IS KNOWN AND DESIGNATED AS:
- TAX MAP 152L GROUP H, PARCELS 001-002, 008-010, 018-019, AND 021-022
- DEED REFERENCES: 201608300014165
- LOTS 16-17, 19-21, 28-29, & 37-38 OF EASTON PARK UNIT 2
- PLAT REFERENCE: 202001100046127
GRID NORTH IS BASED ON A BEARING OF N32°41'16"E FROM TOWN OF FARRAGUT CONTROL POINT # 239 TO POINT # 24 AND IS NAD83
HORIZONTAL DATUM DISTANCES HAVE NOT BEEN REDUCED TO GRID
THE PURPOSE OF THIS PLAT IS TO RESUBDIVIDE THE 9 (NINE) LOTS SHOWN HEREIN INTO 5 (FIVE) LOTS AS SHOWN LOWERING THE TOTAL NUMBER OF BUILDABLE LOTS WITHIN THIS DEVELOPMENT TO 30 - NOTE
- SHADED AREA SHOWN IS NOT INCLUDED IN THIS PLAT.
7. PER FLOOD INSURANCE RATE MAP (FIRM) 470830356F AND 47096C0357G LAST REVISED MAY 2, 2007 AND AUGUST 5, 2013 RESPECTIVELY, THE PROPERTY IS NOT LOCATED IN A SPECIAL FLOOD HAZARD ZONE.
8. 15' UTILITY EASEMENT, 7.5' EACH SIDE, OF ALL WATER AND SANITARY SEWER LINES AS INSTALLED. SEE INST. NO. 200908100011386.
9. 20' DRAINAGE EASEMENT, 10' EACH SIDE, OF ALL STORM SEWER LINES AS INSTALLED.
10. SEE SHEET 1 FOR CERTIFICATION STAMPS.
11. THE TOWN OF FARRAGUT IS RESPONSIBLE FOR MAINTENANCE OF THE PAVED GREENWAYS AND MOWING WITHIN THE GREENWAY EASEMENTS SHOWN. ALL OTHER MAINTENANCE (INCLUDING MAINTENANCE OF ALL DRAINAGE DITCHES) WILL REMAIN THE RESPONSIBILITY OF THE AFFECTED LOT OWNERS.



CURVE	LENGTH	RADIUS	CHORD	CHORD BEARING	TANGENT
GC1	25.39'	44.00'	27.60'	S54°59'26"E	14.71'
GC2	45.49'	84.00'	44.93'	N81°59'28"E	23.32'
GC3	101.17'	64.00'	90.96'	S00°10'01"W	64.64'
GC4	20.02'	175.00'	20.01'	S03°41'27"W	10.02'
GC5	67.25'	94.00'	65.47'	N13°10'58"W	35.50'
GC6	72.72'	100.00'	70.80'	S64°55'59"W	39.40'

- LEGEND OF SYMBOLS**
- WV = WATER VALVE
 - CH = FIRE HYDRANT
 - W = WATER LINE
 - JB = JUNCTION BOX
 - AI = AREA INLET
 - CI = CURB INLET
 - S = STORM DRAIN PIPE
 - SM = SANITARY MANHOLE
 - SL = SEWER LINE
 - GM = GAS METER
 - GV = GAS VALVE
 - GL = GAS LINE
 - UP = UTILITY POLE
 - OL = OVERHEAD UTILITY LINES
 - ET = ELECTRIC TRANSFORMER
- (NOT INCLUDED)

SETBACK REQUIREMENTS FOR "R-3" ZONE

- Front yard

a. If the street is classified as an arterial on the Major Road Plan, all principal buildings shall be set back from the nearest point of any right-of-way a minimum of 50 feet;

b. If the street is classified as a minor collector on the Major Road Plan, all principal buildings shall be set back from the nearest point of any right-of-way a minimum of 40 feet;

c. If the street is classified as a local street on the Major Road Plan, all principal buildings shall be set back from the nearest point of any right-of-way a minimum of 30 feet;

d. If the street is classified as a local street on the Major Road Plan, all principal buildings shall be set back from the nearest point of any right-of-way a minimum of 20 feet; and

e. All agricultural structures, excluding fences, shall be set back a minimum of 35 feet; and

f. All accessory structures, excluding fences, detention basin structures, subdivision walls, entrance pillars, and certain utility structures, shall be set back from the nearest point of any right-of-way a minimum of 25 feet, except as provided for elsewhere in this ordinance or the Farragut Municipal Code.

- Side yard

a. All principal buildings shall be set back a minimum of ten feet; and

b. All agricultural structures, excluding fences, shall be set back a minimum of 35 feet; and

c. All accessory structures, excluding fences, shall be set back a minimum of 15 feet; and

- Rear yard

a. All principal buildings shall be set back a minimum of 25 feet, except when the rear yard abuts a required buffer strip and then all principal buildings shall be set back a minimum of 20 feet;

b. All agricultural structures, excluding fences, shall be set back a minimum of 35 feet; and

c. All accessory structures, excluding fences, shall be set back a minimum of 15 feet.

LINE BEARING DISTANCE

1	N42°42'27"W	12.21'
2	N25°42'41"W	11.51'
3	S53°15'10"W	16.96'
4	N26°42'35"W	22.91'
5	S32°16'48"E	45.32'
6	S55°15'10"W	11.72'
7	S29°47'57"W	27.25'
8	S35°04'41"E	44.41'
9	S26°35'11"W	27.78'
10	S28°47'57"W	64.30'

LINE BEARING DISTANCE

GL1	N63°22'41"E	25.62'
GL2	N63°22'41"E	20.30'
GL3	N63°22'41"E	257.61'
GL4	S30°26'19"E	28.26'
GL5	S73°24'35"E	21.56'
GL6	N64°27'11"E	162.50'
GL7	N63°22'41"E	32.22'
GL8	N50°00'15"E	64.44'
GL9	S35°32'49"E	20.06'
GL10	S50°00'15"W	65.23'
GL11	S63°22'41"W	33.01'
GL12	S54°27'11"W	150.94'
GL13	S38°28'19"E	702.07'
GL14	S84°40'09"E	191.55'
GL15	N84°40'09"W	261.07'
GL16	N56°28'56"W	719.29'
GL17	N75°30'00"W	100.00'
GL18	N54°55'59"W	39.40'

NOTE: DATA COLLECTION AND DRAWING SERVICES PROVIDED BY SMOKEY MOUNTAIN AND SURVEYING CO., INC.
PLS DWG NO. 160078R4

SHEET 2 OF 2

SITE, INCORPORATED
CIVIL ENGINEERS & SURVEYORS
EST. 1999
10215 Technology Drive, Suite 304
Knoxville, TN 37932
(865) 777-4160
www.site-incorporated.com

HOWARD T. DAWSON
REGISTERED LAND SURVEYOR
Tennessee No. 36166-20-001

Final Plat of Resub. of Lots 16-17, 19-21, 28-29, & 37-38
Easton Park Unit 2
Turkey Creek Road near Briarstone Lane
Civil District No. 6 of Knox County, Tennessee
Town of Farragut

REVISIONS

NO.	DATE	COMMENTS

ORIGINAL ISSUE: 10/16/2020
SITE PROJECT#: 1926
FILE: 160078R4

PLAT

REPORT TO THE FARRAGUT MUNICIPAL PLANNING COMMISSION

PREPARED BY: Bart Hose, Assistant Community Development Director

SUBJECT: Discussion and public hearing on a final plat for the Ivey Farms Subdivision, Unit 1, Phase 1, located on the north side of Union Road, Zoned R-1/OSR, 6.26 Acres, 26 Lots (SITE, Incorporated, Applicant)

INTRODUCTION AND BACKGROUND: This item involves the final plat for Unit 1, Phase I of the Ivey Farms Subdivision located off Union Road. The plat includes 26 building lots, Baltica Lane, a connection/extension to Pecos Road, and the entranceway section of Ivey Farms Road from Union Road to the traffic circle within the development and Baltica Lane.

DISCUSSION: The developers of this subdivision will be required to complete construction of the traffic circle and entrance along Union Road before any building permits are issued. In addition, the connection to Pecos Road will not be opened until one of the following two things takes place: 1. the number of building permits issued in Phase I reaches 75% of the total buildable lots in that phase; or 2. the final plat for Phase 3 of the Ivey Farms Subdivision is recorded.

RECOMMENDATION: Included in your packet is the applicant's revised plat. Staff will make a recommendation at the meeting based on whether and how the applicant has addressed all initial staff comments.

- NOTES
1. NOTIFY TENNESSEE ONE-CALL SYSTEM AT 1-800-351-1111 AND AN INDIVIDUAL UTILITY AUTHORITY BEFORE ANY EXCAVATION FOR EXACT LOCATION OF ALL UNDERGROUND UTILITIES.
 2. A FIVE (5) FOOT UTILITY, DRAINAGE AND CONSTRUCTION EASEMENT ON EACH SIDE OF INTERIOR LOT LINES, A TEN (10) FOOT UTILITY, DRAINAGE AND CONSTRUCTION EASEMENT ON INSIDE OF ROAD RIGHTS-OF-WAY AND EXTERIOR LOT LINES. THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMMERCE SUCH UTILITIES IN THE AREA EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. HOWEVER, HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THIS SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.
 3. 5/8" IRON PINS SET AT ALL CORNERS UNLESS NOTED OTHERWISE.
 4. PROPERTY IS ZONED "OSR" MINIMUM BUILDING SETBACKS ARE TO CONFORM TO CURRENT REQUIREMENTS OF THE TOWN OF FARRAGUT ZONING ORDINANCE. SETBACK REQUIREMENTS: -FRONT, 20' (FRONT FACING GARAGE 30') -SIDE, 10' -REAR, 25'
 5. PROPERTY IS KNOWN AND DESIGNATED AS: -TAX MAP 151, PART OF PARCELS 054 & 054.01 -DEED REFERENCES: 201810260027479 AND 20180600203359
 6. GRID NORTH IS BASED ON THE T.D.T.C. C.O.R.S. NETWORK. THE PURPOSE OF THIS PLAT IS TO CREATE THE 28 LOTS SHOWN HEREON AND TO DELEGATE EASEMENTS AND RIGHT-OF-WAYS AS SHOWN.
 7. PER FLOOD INSURANCE RATE MAP (FIRM) #208303359 (LAST REVISED MAY 2, 2007), THE PROPERTY IS NOT LOCATED IN A SPECIAL FLOOD HAZARD ZONE.
 8. 15' UTILITY EASEMENT, 7.5' EACH SIDE, OF ALL WATER AND SANITARY SEWER LINES AS INSTALLED.
 9. PROPERTY OWNERS SHALL BE RESPONSIBLE FOR MAINTENANCE OF STORMWATER IMPROVEMENTS ON THIS PROPERTY. THIS PLAT CONSISTS OF 28 RESIDENTIAL LOTS TOTALING 8.26 ACRES. -REFER TO PRELIMINARY PLAT OF NEW FARMS FOR OPEN SPACE CALCULATIONS.
 10. ROUNDABOUT AND ACCESS TO NEW FARM ROAD MUST BE COMPLETED PRIOR TO ISSUING OF BUILDING PERMITS.

CERTIFICATE OF SURVEY ACCURACY

I hereby certify that the plan shown and described herein is a true and correct survey to the accuracy required by the Farragut Municipal Planning Commission and that the monuments have been placed as shown herein to the specification of the Subdivision Regulations. This is a Category I Land Survey and the ratio of precision of the unadjusted survey is equal to or greater than 1/10,000.

Surveyor / No. 1301 Date 10-30-20
THIS IS TO CERTIFY THAT THIS SURVEY MEETS THE MINIMUM STANDARDS FOR THE STATE OF TENNESSEE.

SURVEYOR: HOWARD T. DAWSON, RLS 1301
SITE INCORPORATED
10215 TIO-MOORE DR.
KNOXVILLE, TN 37932
PH: (865) 777-4160



This is to certify that all property taxes and assessments due on this property have been paid.

Signed: _____ Date: _____
Knox County Trustee

CERTIFICATE OF STREETS APPROVAL

I certify that streets, sidewalks, and other required improvements have been installed in an acceptable manner and according to Town specifications, or that a security bond in the amount of \$_____ has been posted with the Planning Commission to assure completion of all required improvements in case of default. Streets (are) (are not) public streets maintained at public expense.

Town Engineer _____ Date _____
License No. _____

CERTIFICATE OF APPROVAL FOR RECORDING

I hereby certify that the subdivision shown herein has been found to comply with the Subdivision Regulations for Farragut, Tennessee, with the exception of such variances, if any, as are noted in the minutes of the Planning Commission and that it has been approved for recording in the Office of the County of Registrar of Deeds.

Secretary Planning Commission _____ Date _____

CERTIFICATE OF APPROVAL OF STREET NAMES

This is to certify that the subdivision shown herein has been reviewed for compliance with the Knox County Uniform Street Naming and Addressing System Ordinances, and the road names are hereby approved for recording.

_____ Date _____
Telephone: _____ Name, Title, and Agency of Authorizing Approving Agent

CERTIFICATE OF ELECTRIC, GAS & TELEPHONE AVAILABILITY

This is to certify that every lot within this subdivision has available to it a source for the service identified by signature(s) below which service source is adequate to accommodate the reasonable needs of such lot as to such service within such subdivision.

Do= _____ GAS- Name, Title, and Agency of Authorized Approving Agent

Do= _____ ELECTRIC- Name, Title, and Agency of Authorized Approving Agent

Do= _____ TELEPHONE- Name, Title, and Agency of Authorized Approving Agent

CERTIFICATION OF COMMON AREAS OCCUPATION

As owner, in recording this plat, I have designated certain areas of land shown herein as common areas intended for use by the homeowners within this subdivision for recreation and related activities. The above described areas are not dedicated for use by the general public, but are dedicated to the common use of the homeowners within the named subdivision.

"Declaration of Covenants and Restrictions," applicable to the above named subdivision, is hereby incorporated and made a part of this plat.

Owner _____ Date _____

CERTIFICATE OF OWNERSHIP AND OCCUPATION

I (we) hereby certify that I am (we are) the owner(s) of the property shown and described herein as evidenced in Book _____ Page _____, County Register Office, and that I (we) hereby adopt this plan of subdivision with my (our) free consent, establish the minimum building restriction lines, and dedicate all streets, alleys, walks, parks, and other open space to public or private use as stated.

_____ Date _____
Name, Title, and Agency of Authorized Approving Agent

CERTIFICATE OF APPROVAL OF WATER SYSTEM

I hereby certify that it has been certified to us that the water system(s) outlined or indicated on the final subdivision plat entitled Ivey Farms, Unit 1, Phase 1, have been installed in accordance with current local and state governmental requirements.

_____ Date _____
Name, Title, and Agency of Authorized Approving Agent

CERTIFICATE OF APPROVAL OF SEWER SYSTEM

I hereby certify that it has been certified to us that the sewer system(s) outlined or indicated on the final subdivision plat entitled Ivey Farms, Unit 1, Phase 1, have been installed in accordance with current local and state governmental requirements.

_____ Date _____
Name, Title, and Agency of Authorized Approving Agent

DATA COLLECTION AND DRAINING SERVICES PROVIDED BY SMOKEY MOUNTAIN LAND SURVEYING CO., INC.
S.M.S. DWS NO. 180041R2

SITE, INCORPORATED
EST. 1991
ENGINEERS & SURVEYORS
10215 Technology Drive, Suite 304
Knoxville, TN 37932
(865) 777-4160
www.siteincorporated.com

HOWARD T. DAWSON
REGISTERED LAND SURVEYOR
No. 1301
Tennessee No. 0038720
10-30-20

Final Plat of
Ivey Farms, Unit 1, Phase 1
Union Road and Ivey Farms Road
Civil District No. 6 of Knox County, Tennessee
--Town of Farragut--

REVISIONS	
NO.	DATE

ORIGINAL ISSUE: 10/16/2020

SITE PROJECT#: 1951

FILE: 180041R2

PLAT

REPORT TO THE FARRAGUT MUNICIPAL PLANNING COMMISSION

PREPARED BY: Bart Hose, Assistant Community Development Director

SUBJECT: Discussion and public hearing on a site plan for a parking lot addition at the St. Elizabeth's Episcopal Church, 110 Sugarwood Drive, Zoned C-1, 4.54 Acres (Urban Engineering, Inc., Applicant)

INTRODUCTION AND BACKGROUND: This request involves a site plan for a parking lot addition at the St. Elizabeth's Episcopal Church. The addition includes 24 new parking spaces located near the church's entrance off Sugarwood Drive. The property is physically constrained with most of the parking to the north toward Kingston Pike. This project is intended to provide for some additional parking that would be closer to the church entrance.

RECOMMENDATION: Included in your packet is the applicant's revised site plan. Staff will make a recommendation at the meeting based on whether and how the applicant has addressed all initial staff comments.

SITE DEVELOPMENT PLANS

U.E.I. PROJECT NO. 2005014

THE DIOCESE OF EAST TENNESSEE ST. ELIZABETH'S EPISCOPAL CHURCH

SITE ADDRESS: 110 SUGARWOOD DRIVE, KNOXVILLE, TENNESSEE 37934
CLT MAP 152, PARCEL 22.02



LOCATION MAP

OWNER / DEVELOPER:
THE DIOCESE OF EAST TENNESSEE
ST. ELIZABETH'S EPISCOPAL CHURCH
110 SUGARWOOD DRIVE
KNOXVILLE, TN 37934
(865) 671-2500



SITE ENGINEER:
URBAN ENGINEERING, INC.
CHRIS SHARP
11852 KINGSTON PIKE
FARRAGUT, TENNESSEE 37934
(865) 966-1924

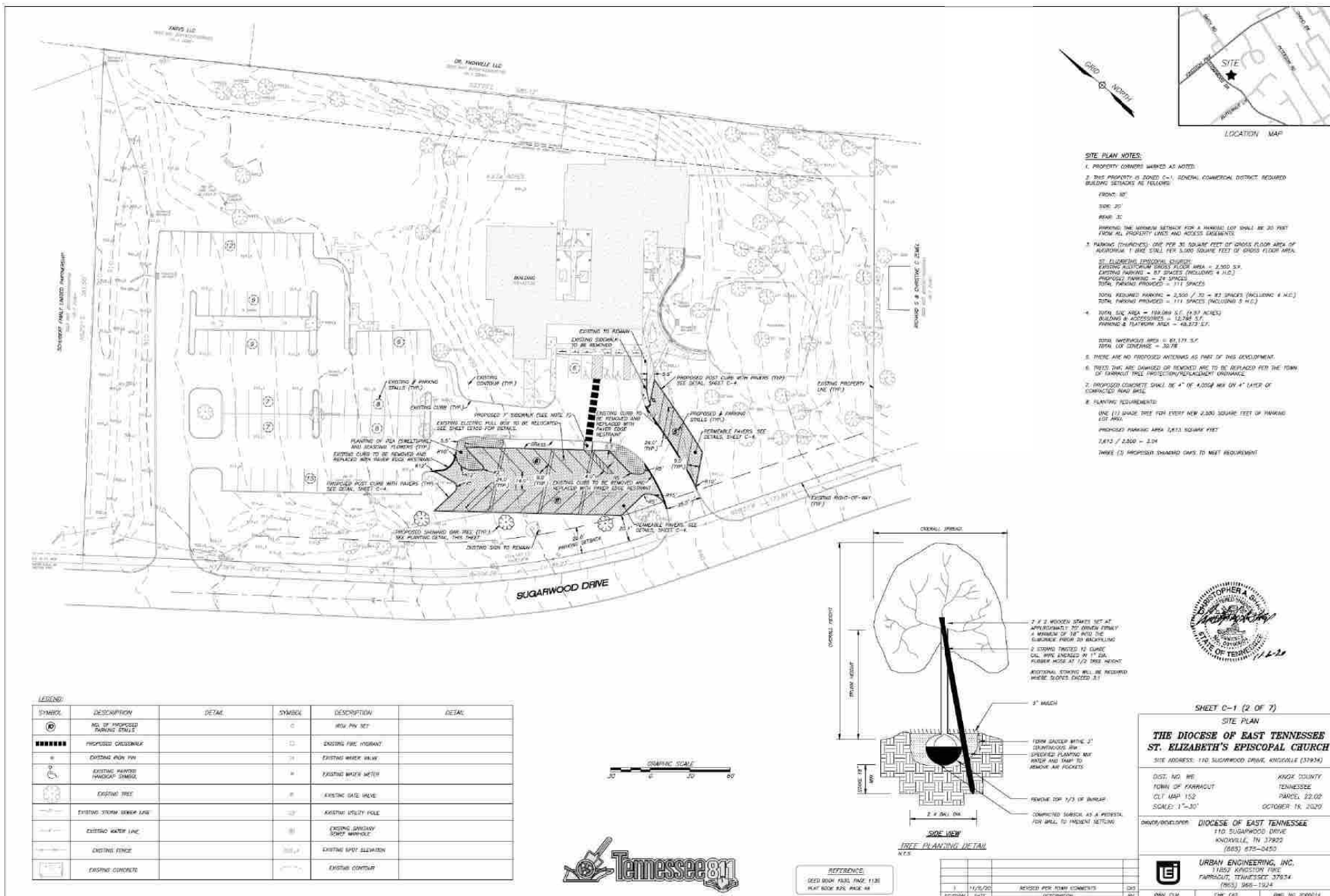
SPECIFICATIONS
EXCEPT WHERE DIRECTED OTHERWISE BY THE PLANS, WORKMANSHIP
AND MATERIAL (BUT NOT MEASUREMENT AND PAYMENT) FOR THIS
PROJECT SHALL BE IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS
AND STANDARDS.
ELECTRICAL — AS DIRECTED BY IECB
GAS — AS DIRECTED BY KUB
WATER — AS DIRECTED BY FIRST UTILITY DISTRICT
CABLE TV — AS DIRECTED BY CHARTER
TELEPHONE — AS DIRECTED BY TDS
TOWN OF FARRAGUT — ALL APPLICABLE TOWN REGULATIONS
AND ORDINANCES

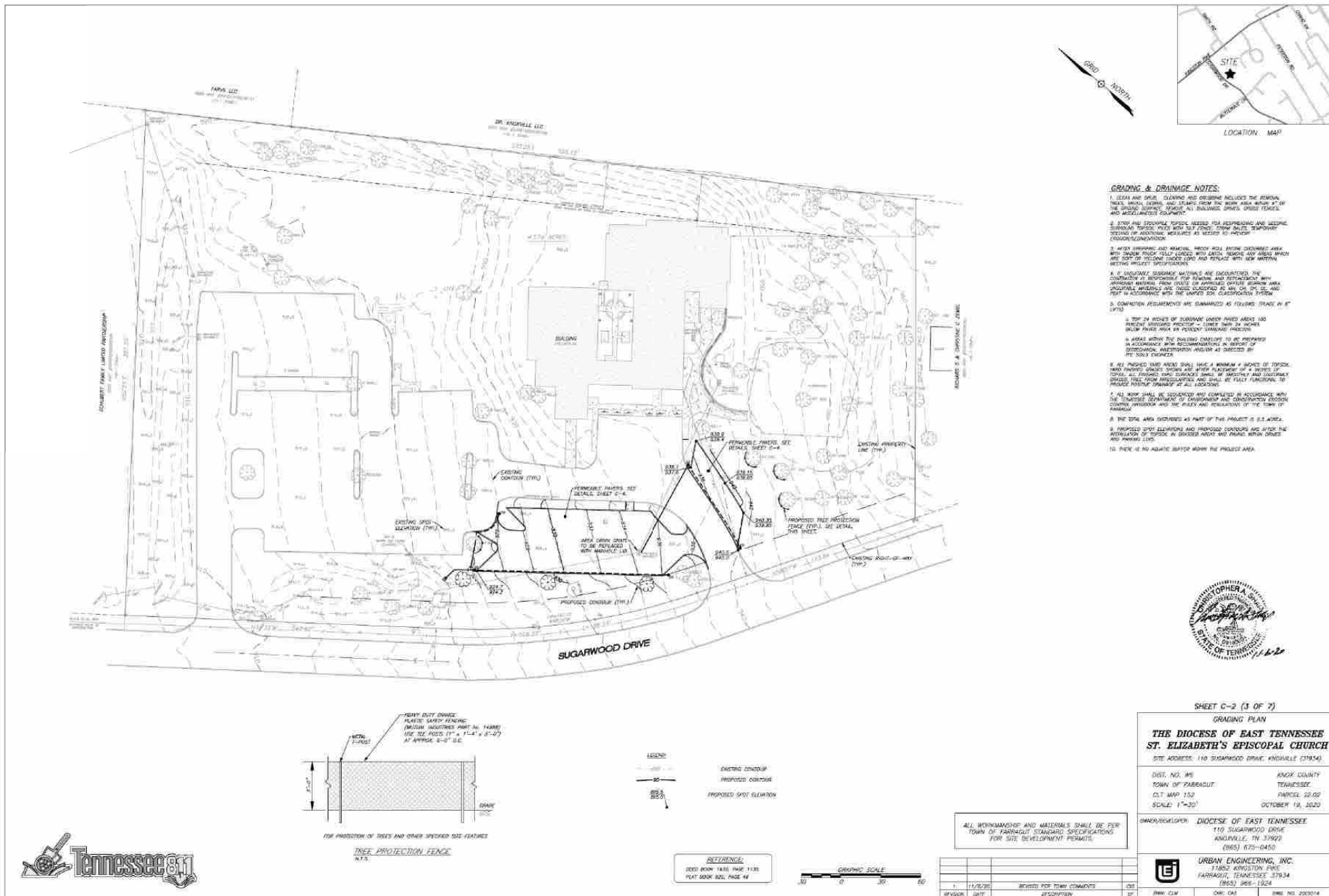
SHEET INDEX

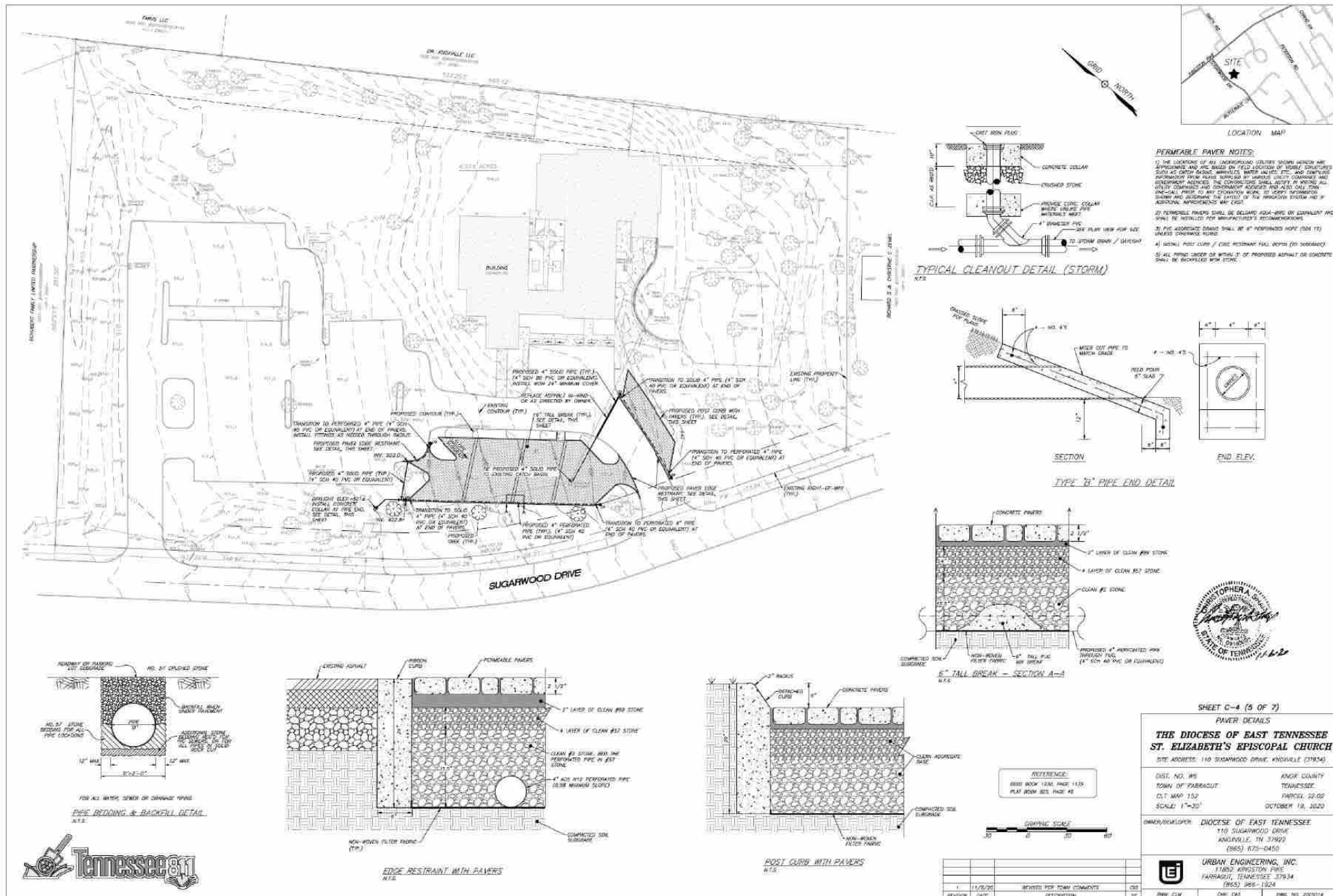
<u>TITLE</u>	<u>SHEET</u>
TITLE SHEET	C-0
SITE PLAN	C-1
GRADING PLAN	C-2
EROSION AND SEDIMENT CONTROL PLAN	C-3
PAVER DETAILS	C-4
SITE ELECTRICAL PLAN	ES100
SITE PHOTOMETRIC PLAN	ES101

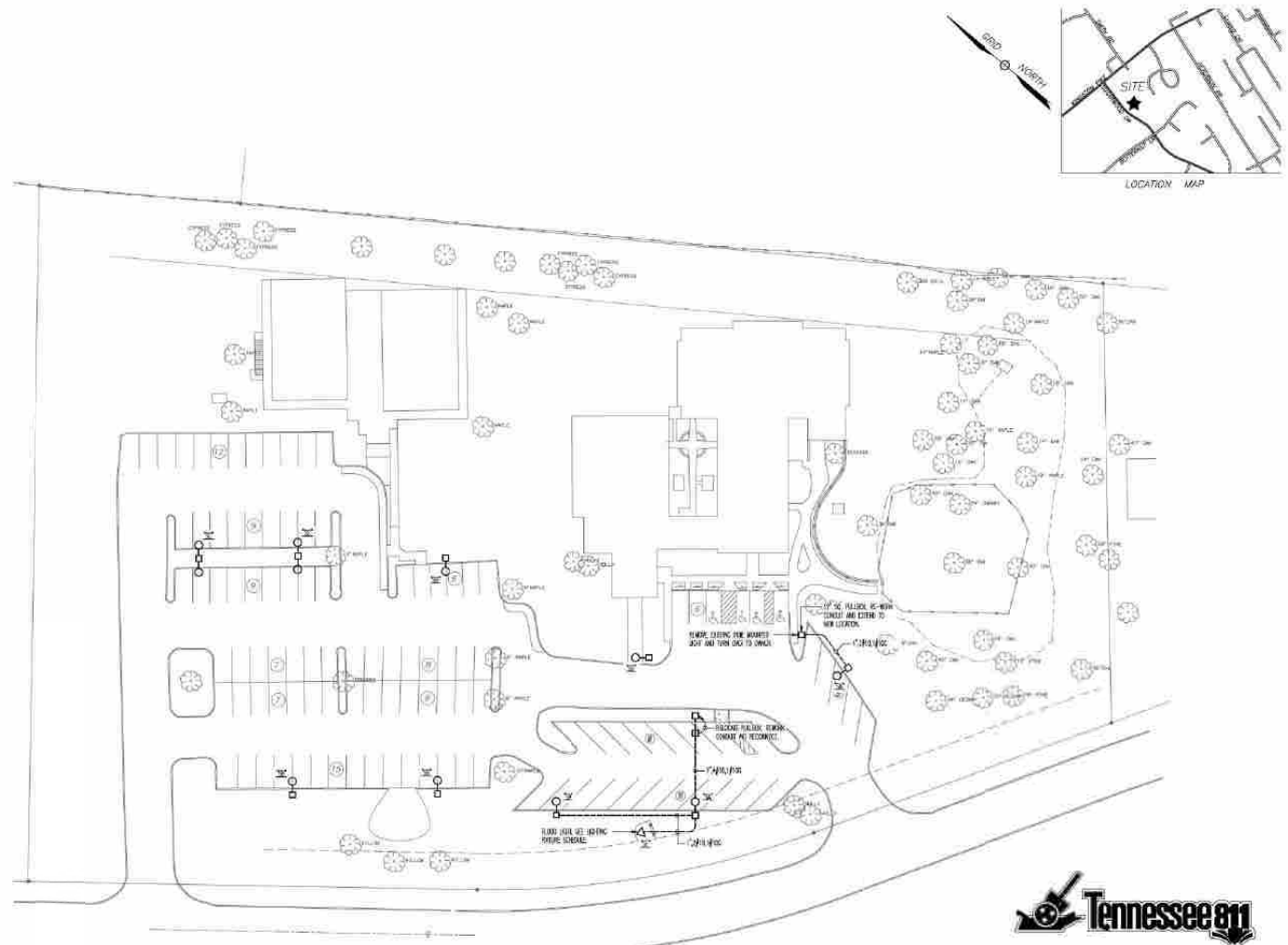
2	11/06/20	TOP SUBMITTAL 2
ISSUE NO.	DATE	DESCRIPTION

SHEET C-0 - 1 OF 7







[illegible]

SITE ELECTRICAL PLAN

1. REFLECT RESULTS "20", "30" & "50" ON TESTING RULERS, MARKING CURRENT CRACKING AND CRACKS.

[illegible]

SHEET 5100 (5 OF 7)

SITE ELECTRICAL PLAN

THE DIOCESE OF EAST TENNESSEE
ST. ELIZABETH'S EPISCOPAL CHURCH

NOTE ADDRESS: 770 SUGARWOOD DRIVE, INDOHVILLE (37634)

DATE AND TIME	KNICK COUNTY
---------------	--------------

TOWN OF FARMINGTON TENNESSEE

CIT MAP 152 MARCEL 22.02

DATE: 1-20 OCTOBER 07, 2020

IMPR/DEVELOPER: DIOCESE OF EAST TENNESSEE
L.O. OF CATHOLIC CHURCH

110 S. GARFIELD DRIVE
KNOXVILLE, TN 37922

(885) 575-0450

 URBAN ENGINEERING, INC.
21852 ARDENWOOD BLVD.

THE **AMERICAN** **FIRE**
FARADAY, TENNESSEE 37934
1981-1982-1983

DATE	TIME	ENC. NO.	FILE NO.
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REPORT TO THE FARRAGUT MUNICIPAL PLANNING COMMISSION

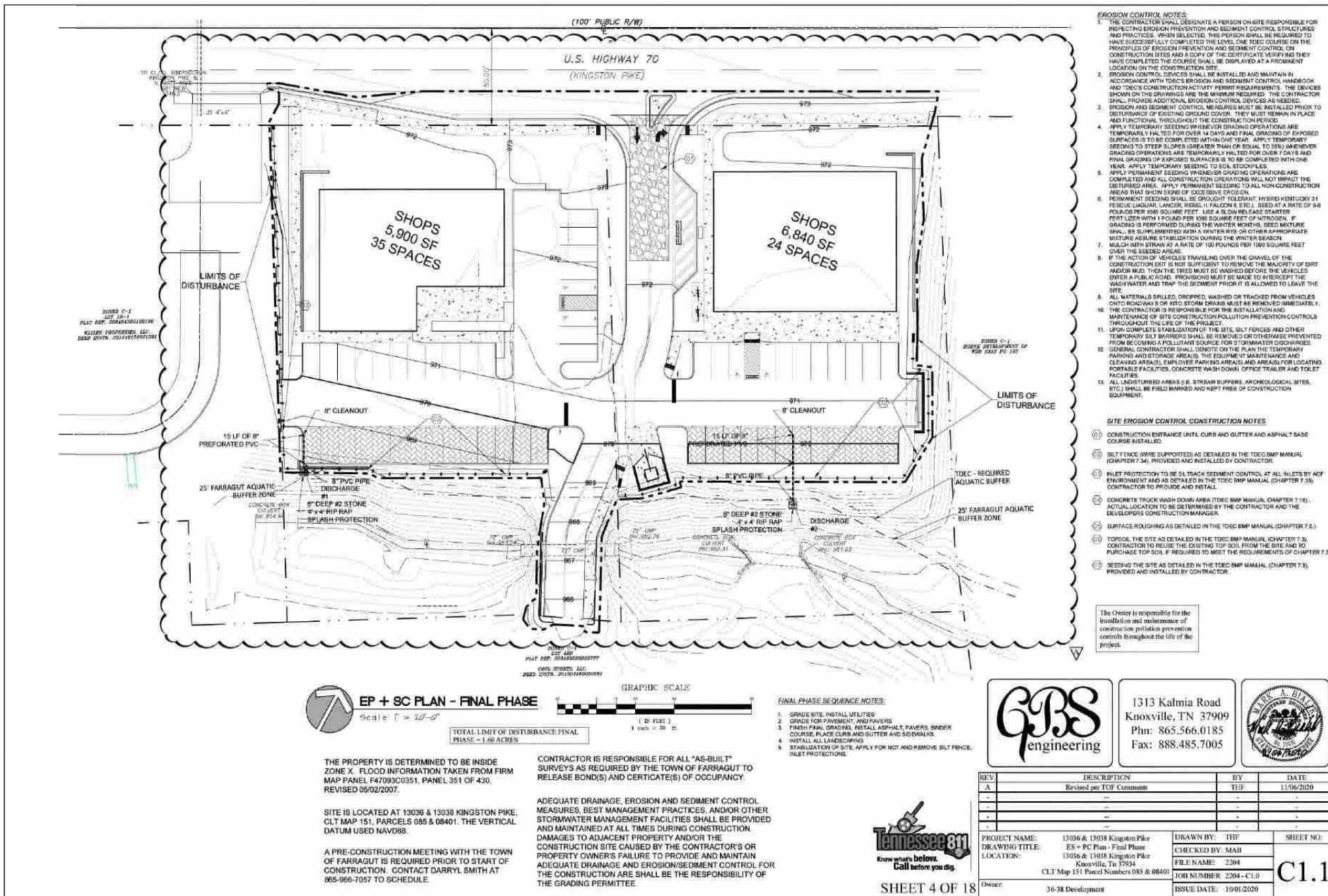
PREPARED BY: Bart Hose, Assistant Community Development Director

SUBJECT: Discussion and public hearing on a site plan for the property located at 13036 and 13038 Kingston Pike, Zoned C-1, 2 Acres (GBS Engineering, Applicant)

INTRODUCTION AND BACKGROUND: This request involves a site plan for the development of two (2) buildings located at 13036 and 13038 Kingston Pike. The site includes two (2) existing lots with shared access, parking, and internal circulation. The development also includes thru access to the Cool Sports development located immediately to the south, and provisions for cross-lot connectivity to the east and west.

RECOMMENDATION: Included in your packet is the applicant's revised site plan. Staff will make a recommendation at the meeting based on whether and how the applicant has addressed all initial staff comments.





CITATIONS IN PARENTHESES INDICATE SECTIONS OF THE CURRENT GSP.

1. SWPPP REQUIREMENTS (3.0)

1.1 HAS THE SWPPP TEMPLATE BEEN PREPARED BY AN INDIVIDUAL THAT HAS THE FOLLOWING CERTIFICATIONS (3.1.1)?

- ☒ YES (CHECK ALL THAT APPLY BELOW) ☐ NO
☒ 1.1.1 A LICENSED PROFESSIONAL IN EROSION AND SEDIMENT CONTROL (EPSC) OR
☒ 1.1.2 A LICENSED PROFESSIONAL ENGINEER OR LANDSCAPE ARCHITECT
☒ 1.1.3 TDS LEVEL II

1.2 DOES THE EPSC PLANS INVOLVE STRUCTURAL DESIGN, HYDRAULIC, HYDROLOGIC OR ENGINEERING CALCULATIONS FOR EPSC STRUCTURAL MEASURES (SEDIMENT BASINS, ETC.) (3.1.1)?

- ☒ YES ☐ NO

IF YES, HAVE THE PLANS BEEN PREPARED, STAMPED AND CERTIFIED BY A LICENSED PROFESSIONAL ENGINEER OR LANDSCAPE ARCHITECT REGISTERED WITH THE STATE OF TENNESSEE?

- ☒ YES ☐ NO

1.3 DO THE PROJECT STORMWATER OUTFALLS DISCHARGE INTO THE FOLLOWING? (3.4.1)

- ☒ YES ☐ NO (CHECK ALL THAT APPLY BELOW)
☒ 1.3.1 WATERS WITH UNAVAILABLE PARAMETERS (20.2) FOR SILTATION OR HABITAT ALTERATION
☐ 1.3.2 TENNESSEE KNOWN EXCEPTIONAL WATERS

IF YES, HAVE THE EPSC PLANS BEEN PREPARED BY AN INDIVIDUAL WHO HAS COMPLETED TDS LEVEL II?

- ☒ YES ☐ NO ☐ N/A (3.4.1.6) AND

IF YES, HAS THE SWPPP TEMPLATE BEEN PREPARED BY AN INDIVIDUAL WHO HAS COMPLETED TDS LEVEL II?

- ☒ YES ☐ NO ☐ N/A (3.4.1.6)

NOTE: THE RECEIVING WATER IS AN UNNAMED TRIBUTARY OF LITTLE TURKEY CREEK DRAINAGE BASIN, WHICH IS LISTED AS IMPAIRED FOR SEDIMENTATION/SILTATION.

2. SITE DESCRIPTION (3.5)

2.1 PROJECT LIMITS TO REFER TO ES & PC PLANS, DRAWINGS C1.0, C1.1, AND C1.2 (3.5.1)

2.2 PROJECT DESCRIPTION (3.5.1.1)

2.3 SITE MAPS: SEE VICINITY MAP ON THIS DRAWING (3.5.1.1)

2.4 DESCRIPTION OF EXISTING TOPOGRAPHY (3.5.1.1)

2.5 MAJOR SOIL DISTURBING ACTIVITIES (3.5.1.1) (CHECK ALL THAT APPLY)

2.6 TOTAL PROJECT AREA (3.5.1.1) APPROXIMATELY 2,002 ACRES

2.7 TOTAL AREA TO BE DISTURBED (3.5.1.1) 1.79 ACRES

2.8 NO MORE THAN 10 ACRES OF ACTIVE SOIL DISTURBANCE IS ALLOWED AT ANY TIME DURING THE CONSTRUCTION OF THE PROJECT.

2.9 ARE THERE ANY SEASONAL LIMITATIONS ON WORK? ☐ YES ☒ NO

IF YES, PLEASE DESCRIBE AND LIST THE CORRESPONDING ES & PC DRAWING WHICH PROVIDES INFORMATION.

3.0 SOIL PROPERTIES (3.5.1.1) (1)

SOIL PROPERTIES FOR THE PRIMARY SOILS ARE LISTED IN THE TABLE BELOW.

SOIL PROPERTIES			
PRIMARY SOIL NAME	HGB	% OF SITE	ERODIBILITY (K value)
CORRYTON LOAM	C	94	0.37
CORRYTON/DOORHENTS URBAN	B	51.3	0.37
HEISKILL SCLT LOAM	C	39.2	0.43
---	---	---	---
---	---	---	---
---	---	---	---
---	---	---	---
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3.10 PROJECT RUNOFF COEFFICIENTS AND AREA PERCENTAGES (3.5.1.1)

RUNOFF COEFFICIENTS FOR EXISTING CONDITIONS			
AREA TYPE	AREA (AC)	% OF WATERSHED	RUNOFF COEFFICIENT
GRASS	2,002	100	67
---	---	---	---
---	---	---	---
---	---	---	---
---	---	---	---
WEIGHTED CURVE NUMBER OR C-FACTOR			
			70

3.10 PROJECT RUNOFF COEFFICIENTS AND AREA PERCENTAGES (3.5.1.1)

RUNOFF COEFFICIENTS FOR POST-DEVELOPED CONDITIONS			
AREA TYPE	AREA (AC)	% OF WATERSHED	RUNOFF COEFFICIENT
ROADS, BUILDINGS, SIDEWALKS	---	VARIES	98
WOODS	---	VARIES	70
LANDSCAPE GRASS	---	VARIES	74
---	---	---	---
---	---	---	---
WEIGHTED CURVE NUMBER OR C-FACTOR			VARIES

3. ORDER OF CONSTRUCTION ACTIVITIES (3.5.1.1, 3.5.1.2)

PHASE	DESCRIPTION
INITIAL	CONSTRUCTION EXIT, SALT FENCE, CONSTRUCT SEDIMENT BARRIERS
INITIAL	DEMOLITION OF EXISTING STRUCTURES, CLEAR AND GRUB SITE
INTER	BEGIN ROUGH GRADING, INSTALL ALL UTILITIES, ESTABLISH BULO DOOR
INTER	PLACE STONE FOR ASPHALT, PLACE CURBS AND ASPHALT BINDER COURSE
FINAL	FINISH FINAL GRADING, CONSTRUCT ALL ROADS AND SIDEWALKS, FINISH ASPH PAVING
FINAL	SURFACE ROUGHING, TOP SOILING, SEEDING AND LANDSCAPING

CONSTRUCTION SHALL BE SEQUENCED AND STAGED TO MINIMIZE THE EXPOSURE TIME OF GRADES OR DENuded SOIL AREAS, PRESERVE TOPSOIL, AND MINIMIZE SOIL COMPACTION. NO WORK SHALL BE STARTED UNTIL THE CONTRACTORS PLAN FOR THE STAGING OF THEIR OPERATIONS. FOLLOWING THE PLAN FOR STAGING OF TEMPORARY AND PERMANENT EPSC MEASURES BEING ACCEPTED BY THE ENGINEER, THE CONTRACTORS EPSC PLAN SHALL INCORPORATE AND SUPPLEMENT, AS ACCEPTABLE, THE ORDER OF CONSTRUCTION ACTIVITIES AND THE BASIC EPSC DEVICES DEPICTED ON THE EPSC PLAN CONTAINED WITHIN THE APPROVED SWPPP.

1. SPECIAL SEQUENCING REQUIREMENTS (SEE SHEETS C1.0, C1.1, AND C1.2)
2. INSTALL STABILIZED CONSTRUCTION EXITS
3. INSTALL PERIMETER PROTECTION WHERE RUNOFF SHEET FLOW FROM THE SITE
4. INSTALL INITIAL EPSC MEASURES BEFORE CLEARING, GRUBBING, EXCAVATION, GRADING, OR ANY OTHER EARTHWORK
5. EXCEPT AS SUCH WORK MAY BE NECESSARY TO INSTALL EPSC MEASURES, PERFORM CLEARING AND GRUBBING (NOT MORE THAN 14 DAYS PRIOR TO GRADING AND EARTHWORK) REFER TO THE STABILIZATION PRACTICES BELOW
6. REMOVE AND STORE TOPSOIL
7. STABILIZE DISTURBED AREAS WITHIN THE 14 DAYS OF COMPLETING ANY STAGE AND/OR PHASE OF ACTIVITY
8. INSTALL STORM BARRIERS AND CULVERTS
9. INSTALL INLET AND CULVERT PROTECTION ONCE STRUCTURES ARE IN PLACE AND CAPABLE OF INTERCEPTING FLOW
10. PERFORM FINAL GRADING AND INSTALL BASE STONE
11. COMPLETE FINAL PAVING AND SEALING OF CONCRETE
12. INSTALL TRAFFIC CONTROL AND PROTECTION DEVICES
13. COMPLETE FINAL STABILIZATION (TOPSOIL, SEEDING, MULCH, EROSION CONTROL, BARRIERS, ETC.)
14. REMOVE TEMPORARY EROSION CONTROLS AND ACCUMULATED SEDIMENT FROM AREAS THAT HAVE ESTABLISHED AT LEAST 70 PERCENT UNIFORM PERMANENT VEGETATIVE COVER.
15. RESTORATION AREAS DISTURBED BY REMOVAL ACTIVITIES

4. STREAM, OUTFALL, WETLAND, TDS, AND ECOLOGY INFORMATION

- 4.1 STREAM INFORMATION
 - 4.1.1 WILL CONSTRUCTION AND/OR EROSION PREVENTION AND SEDIMENT CONTROLS IMPACT ANY STREAMS WITHIN THE PROJECT LIMITS? ☐ YES ☒ NO
 - 4.1.2 HAVE ANY OF THE RECEIVING STATE WATERS LESS THAN OR EQUAL TO 1 FLOW MILE DOWN GRADIENT OF THE PROJECT LIMITS BEEN CLASSIFIED BY TDS AS FOLLOWS: CHECK ALL THAT APPLY
 - ☐ SOLIDS WITH UNAVAILABLE PARAMETERS FOR SILTATION
 - ☐ SOLIDS WITH UNAVAILABLE PARAMETERS FOR HABITAT ALTERATION
 - ☐ EXCEPTIONAL TENNESSEE WATERS (ETW)
 - ☐ RECEIVING WATERS OF THE STATE (3.5.1.1)

RECEIVING STREAM INFORMATION			
NATURAL RESOURCE LABEL	NAME OF RECEIVING NATURAL RESOURCE	IMPAIRED FOR SILTATION OR HABITAT ALTERATION (YES OR NO)	KNOWN EXCEPTIONAL QUALITY WATERS (YES OR NO)
1	UNNAMED TRIB-LITTLE TURKEY CR	YES	NO
2	NOT USED	XX	XX
3	NOT USED	XX	XX
4	NOT USED	XX	XX

4.1.2 ARE THERE ANY WATER QUALITY RIPARIAN BUFFER ZONES REQUIRED FOR WATERS OF THE STATE? (4.1.2, 5.4.2)

- ☐ YES ☒ NO
 IF YES, THEY HAVE BEEN INCLUDED ON DRAWING(S) DRAWINGS C1.5 AND C1.1

IF YES, CHECK THE APPROPRIATE BOX BELOW FOR SIZE OF BUFFER

- ☐ 50 FEET FOR IMPAIRED AND EXCEPTIONAL WATERS (AVERAGE WIDTH PER SIDE WITH A MINIMUM OF 30 FEET)

A 50 FOOT NATURAL WATER QUALITY RIPARIAN BUFFER ZONE ADJACENT TO AND ON BOTH SIDES OF THE RECEIVING STATE STREAM WITH THIS DESIGNATION SHALL BE PRESERVED TO THE MAXIMUM EXTENT PRACTICABLE DURING CONSTRUCTION ACTIVITIES AT THE SITE. THE 50 FOOT CRITERION FOR THE WIDTH OF THE BUFFER CAN BE ESTABLISHED ON AN AVERAGE WIDTH BASES AT A PROJECT, AS LONG AS THE MINIMUM WIDTH OF THE BUFFER ZONE IS MORE THAN 10 FEET AT ANY MEASURED LOCATION. IF THE CONSTRUCTION SITE ENCOMPASSES BOTH SIDES OF A STREAM, BUFFER AVERAGING CAN BE APPLIED TO BOTH SIDES, BUT MUST BE APPLIED INDEPENDENTLY.

- ☐ 30 FEET FOR ALL OTHER STREAMS (AVERAGE WIDTH PER SIDE WITH A MINIMUM OF 15 FEET)

A 30 FOOT NATURAL WATER QUALITY RIPARIAN BUFFER ZONE ADJACENT TO AND ON BOTH SIDES OF THE RECEIVING STATE STREAM SHALL BE PRESERVED TO THE MAXIMUM EXTENT PRACTICABLE DURING CONSTRUCTION ACTIVITIES AT THE SITE. THE 30 FOOT CRITERION FOR THE WIDTH OF THE BUFFER ZONE CAN BE ESTABLISHED ON AN AVERAGE WIDTH BASES AT A PROJECT, AS LONG AS THE MINIMUM WIDTH OF THE BUFFER ZONE IS MORE THAN 10 FEET AT ANY MEASURED LOCATION. IF THE CONSTRUCTION SITE ENCOMPASSES BOTH SIDES OF A STREAM, BUFFER AVERAGING CAN BE APPLIED TO BOTH SIDES, BUT MUST BE APPLIED INDEPENDENTLY.

4.1.5 ARE THERE ANY WATER QUALITY RIPARIAN BUFFER ZONES NOT REQUIRED FOR STATE WATERS DUE TO A TDS ADAP?

- ☐ YES ☒ NO

4.1.6 ARE THERE WATER QUALITY RIPARIAN BUFFER ZONE EXEMPTIONS? (4.1.3.1)

- ☐ YES ☒ NO

4.1.7 EVERY ATTEMPT SHOULD BE MADE FOR CONSTRUCTION ACTIVITIES TO NOT TAKE PLACE WITHIN THE WATER QUALITY RIPARIAN BUFFER ZONE AND FOR EXISTING FORESTED AREAS TO BE PRESERVED (3.4.2.1)

4.1.8 BECAUSE OF HEAVY SEDIMENT LOAD ASSOCIATED WITH CONSTRUCTION SITE RUNOFF, WATER QUALITY RIPARIAN BUFFER ZONES ARE NOT SEDIMENT CONTROL MEASURES. THE WATER QUALITY RIPARIAN BUFFER ZONE SHALL BE ESTABLISHED BETWEEN THE TOP OF THE STREAM BANK AND THE DISTURBED CONSTRUCTION AREA.

4.1.9 WHERE IT IS NOT PRACTICABLE TO MAINTAIN A FULL WATER QUALITY RIPARIAN BUFFER, BEST MANAGEMENT PRACTICES (BMPs) PROVIDES EQUIVALENT PROTECTION AS THE NATURAL RIPARIAN ZONE MUST BE USED. A JUSTIFICATION FOR USE AND DESIGN EQUIVALENCY SHALL BE DOCUMENTED WITHIN THE SWPPP. THE ENVIRONMENTAL AND ROADWAY DESIGN DIVISION SHALL REVIEW AND APPROVE THE REVISION OF THE SWPPP BEFORE DISTURBANCE OF THE SITE PROCEEDS. UNLESS PREVIOUSLY EXEMPT IN THE TDS GSP, THESE SEDIMENT MANAGEMENT REQUIREMENTS WILL PREVAIL IF IN CONFLICT WITH THESE BUFFER ZONE REQUIREMENTS.

4.2 RECEIVING WATERS OF THE UNITED STATES (WOTUS) (EPHEMERAL)

- WILL CONSTRUCTION AND/OR EROSION AND SEDIMENT CONTROLS IMPACT ANY WOTUS (EPHEMERAL)? ☐ YES ☒ NO

RECEIVING WATERS (EPHEMERAL) INFORMATION		
WOTUS LABEL	LOCATED WITHIN PROJECT LIMITS (YES OR NO)	LOCATED WITHIN 15FT OF THE PROJECT LIMITS (YES OR NO)
UNNAMED TRIB-LITTLE TURKEY CR	YES	NO

4.2.1 ARE WATER QUALITY RIPARIAN BUFFER ZONES REQUIRED FOR WOTUS? (4.1.2)

- ☐ YES ☒ NO

IF YES, A 15 FOOT NATURAL WATER QUALITY RIPARIAN BUFFER ZONE ADJACENT TO AND ON BOTH SIDES OF THE RECEIVING EPHEMERAL STREAM IDENTIFIED AS A WOTUS (EPHEMERAL) BY THE U.S. ARMY CORPS OF ENGINEERS (USACE) OR THE ENVIRONMENTAL PROTECTION AGENCY SHALL BE PRESERVED TO THE MAXIMUM EXTENT PRACTICABLE DURING CONSTRUCTION ACTIVITIES AT THE SITE.

IF YES, THEY HAVE BEEN INCLUDED ON PLAN SHEET (I)

4.2.2 ARE THERE ANY WATER QUALITY RIPARIAN BUFFER ZONES NOT REQUIRED FOR WOTUS (EPHEMERAL) DUE TO A USACE PERMIT? ☐ YES ☒ NO

4.3. OUTFALL INFORMATION

4.3.1 OUTFALL TABLE (3.5.1.1) SEE SWPPP SHEET C1.5 FOR OUTFALL INFORMATION.

4.3.2 HAVE ALL OUTFALLS BEEN LABELED ON THE EPSC PLAN SHEET? (3.5.1.1)

- ☒ YES ☐ NO

4.3.3 HAVE ALL OUTFALLS BEEN LABELED ON A USGS TOPOGRAPHIC MAP? (3.5.1.1)

- ☒ YES ☐ NO

4.3.4 WHERE POSSIBLE, HAS NON-POINT RUNOFF BEEN DIVERTED AROUND OR THROUGH THE PROJECT TO ELIMINATE CONTACT WITH DISTURBED AREAS OF THE PROJECT AND SEPARATE IT FROM PROJECT RUN-OFF, THEREBY REDUCING THE DRAINAGE AREA OF TO THE OUTFALLS IN THIS AREA?

- ☒ YES ☐ NO ☐ N/A

4.3.5 ARE EQUIVALENT MEASURES BEEN SUBSTITUTED FOR A SEDIMENT BASIN?

- ☒ YES ☐ NO ☐ N/A

4.3.6 A SEDIMENT BASIN OR EQUIVALENT MEASURES WILL BE PROVIDED FOR ANY OUTFALL IN A DRAINAGE AREA.

IF TEN ACRES OR MORE FOR AN OUTFALL THAT DOES NOT DISCHARGE TO A STATE STREAM WITH UNAVAILABLE PARAMETERS OR EXCEPTIONAL TENNESSEE WATERS (A TEMPORARY (OR PERMANENT) SEDIMENT BASIN THAT PROVIDES STORAGE FOR A CALCULATED VOLUME OF RUNOFF FROM A 5 YEAR 24 HOUR STORM EVENT AND RUNOFF FROM EACH SIDE DRAINING, OR EQUIVALENT CONTROL MEASURES SHALL BE PROVIDED UNTIL FINAL STABILIZATION OF THE SITE (3.5.1.1)

OR OF FIVE ACRES OR MORE FOR AN OUTFALL THAT DISCHARGES TO A STATE STREAM WITH UNAVAILABLE PARAMETERS OR EXCEPTIONAL TENNESSEE WATERS (A TEMPORARY (OR PERMANENT) SEDIMENT BASIN THAT PROVIDES STORAGE FOR A CALCULATED VOLUME OF RUNOFF FROM A 5 YEAR 24 HOUR STORM EVENT AND RUNOFF FROM EACH SIDE DRAINING, OR EQUIVALENT CONTROL MEASURES SHALL BE PROVIDED UNTIL FINAL STABILIZATION OF THE SITE (3.5.1.1)

4.4 WETLAND INFORMATION

WILL CONSTRUCTION AND/OR EROSION AND SEDIMENT CONTROLS IMPACT ANY WETLANDS?

- ☐ YES ☒ NO

IF YES, THE STRUCTURAL EPSC MEASURES HAVE BEEN INCLUDED IN THE TOTAL PROJECT IMPACTS AND IN THE WATER QUALITY PERMITS.

WETLAND INFORMATION		
WETLAND LABEL	TEMPORARY IMPACTS (AC)	PERMANENT IMPACTS (AC)
N/A	N/A	N/A

4.5 TOTAL MAXIMUM DAILY LOADS (TMDL) INFORMATION (3.5.1.1)

4.5.1 IS THIS PROJECT LOCATED IN THE HUC-8 WATERSHED THAT MAINTAINS AN EPA APPROVED TMDL FOR SILTATION AND HABITAT ALTERATION?

- ☒ YES ☐ NO

4.5.2 IF YES, IS THIS PROJECT LOCATED WITHIN A HUC-12 SUBWATERSHED WITH A WASTE LOAD ALLOCATION (WLA)?

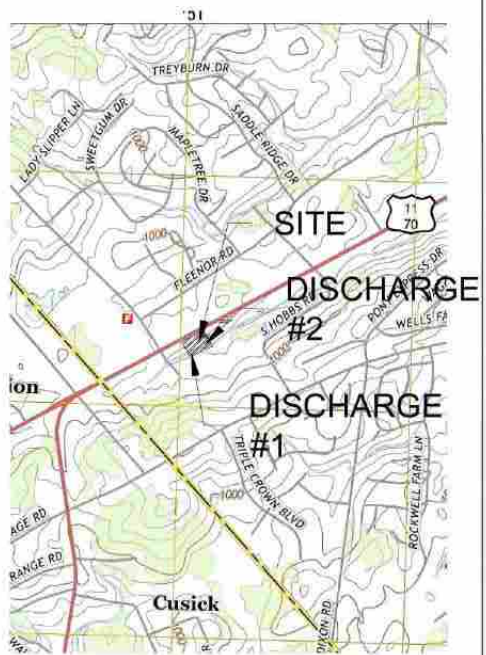
- ☐ YES ☒ NO

4.5.3 IF YES, DOES THE PROJECT HAVE A DIRECT DISCHARGE TO A 303(G) LISTED STREAM FOR SILTATION OR HABITAT ALTERATION?

- ☒ YES ☐ NO

4.5.4 IF YES, HAS A SUMMARY OF THE CONSULTATION LETTER BEEN SUBMITTED/RECEIVED?

- ☐ YES ☒ NO



VICINITY MAP

N.T.S.

SEE COVER SHEET FOR LEGEND.

1313 Kalmia Road
Knoxville, TN 37909
Phn: 865.566.0185
Fax: 888.485.7005

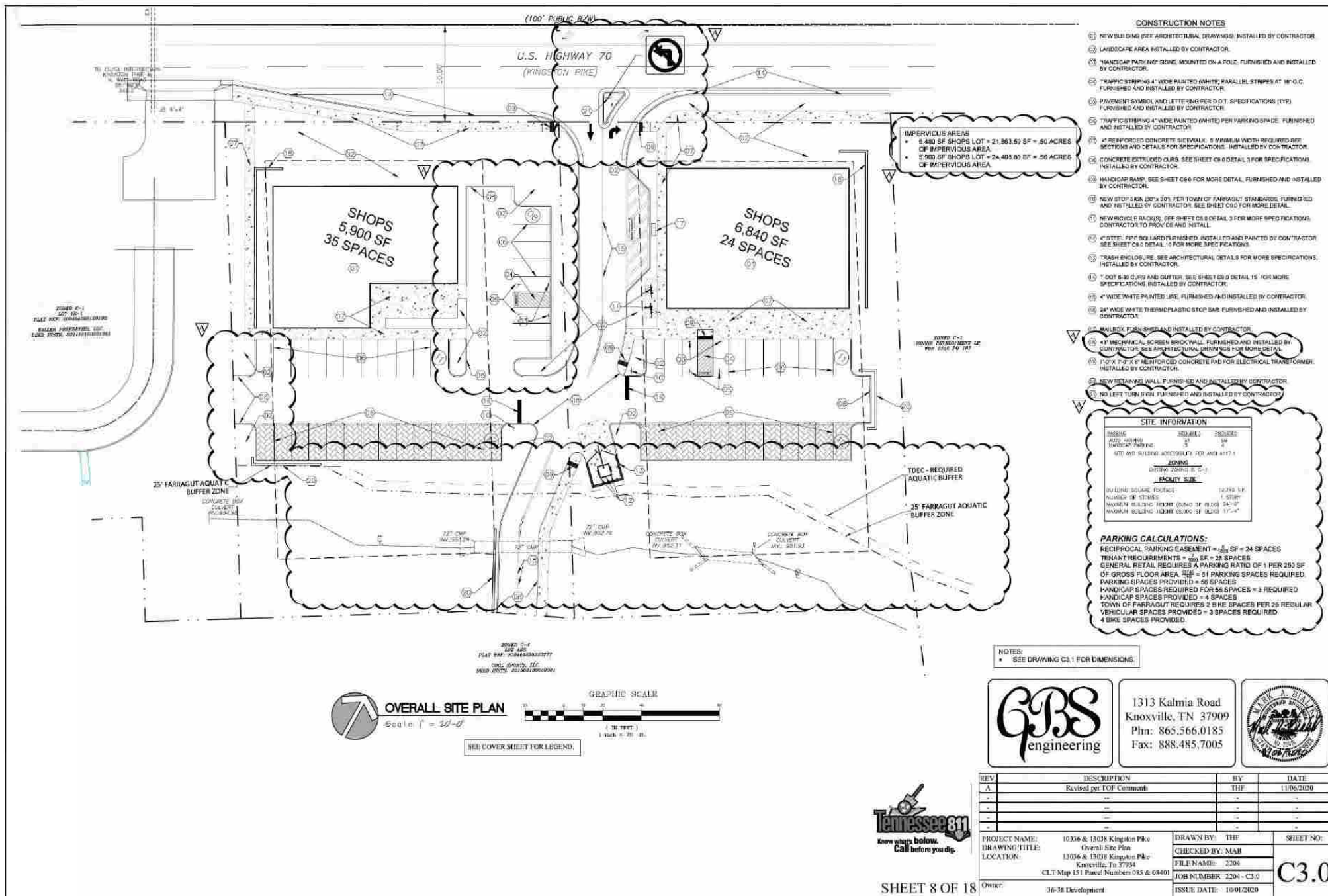
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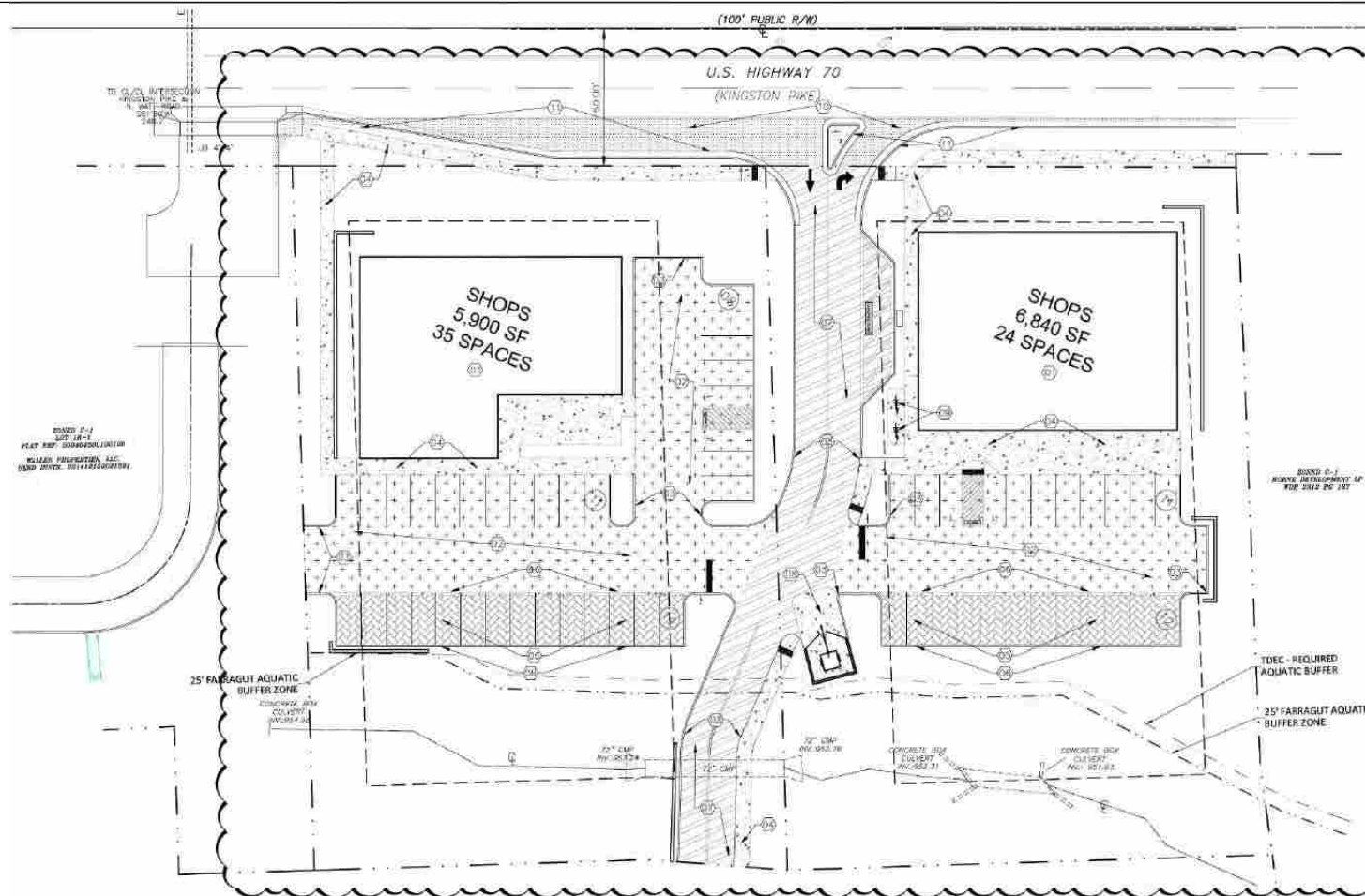
PROJECT NAME:	13036 & 13038 Kingston Pike SWPPP	DRAWN BY:	THF	SHEET NO:	
LOCATION:	13036 & 13038 Kingston Pike Knoxville, TN 37934	CHECKED BY:	MAB		
	CLT Map 151 Parcel Numbers 085 & 08401	FILE NAME:	2204		
Owner:	36-38 Development	JOB NUMBER:	2204-CLD		
		ISSUE DATE:	10/01/2020		



SHEET 5 OF 18

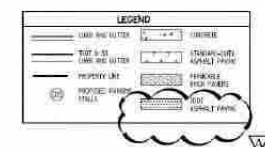
Case 3:23-cv-00402-TRM-JEM Document 6-32 Filed 11/11/23 Page 27 of 393 PageID #: 1436



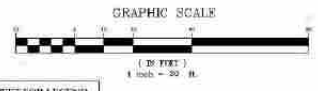


- CONSTRUCTION NOTES**
1. NEW BUILDING (SEE ARCHITECTURAL DRAWINGS), INSTALLED BY CONTRACTOR.
 2. STANDARD DUTY ASPHALT PAVEMENT, SEE DRAWING C5.0 DETAIL 2 FOR MORE DETAILS.
 3. CONCRETE EXTRUDED CURB, SEE SHEET C5.0 DETAIL 3 FOR SPECIFICATIONS, INSTALLED BY CONTRACTOR.
 4. 4" REINFORCED CONCRETE SIDEWALK, 8" WIDE MINIMUM, SEE DRAWING C5.0 FOR MORE DETAILS.
 5. PERMEABLE PAVEMENT, SEE SHEET C5.0 DETAIL 5 FOR SPECIFICATIONS.
 6. NEW CONCRETE - HEADER FOR PERMEABLE PAVEMENT SEPARATION, SEE DETAIL 17 ON SHEET C5.0 FOR MORE INFORMATION, CONTRACTOR TO PROVIDE AND INSTALL.
 7. HEAVY DUTY ASPHALT PAVEMENT, SEE DRAWING C5.0 FOR MORE DETAILS.
 8. CONCRETE PAVEMENT, SEE DRAWING C5.0 FOR MORE DETAILS.
 9. HEAVY BICYCLE RACK, SEE DETAILS FOR MORE DETAIL, CONTRACTOR TO PROVIDE AND INSTALL.
 10. 1" OOF ASPHALT PAVEMENT, SEE DRAWING C5.0 DETAIL X FOR MORE DETAILS.
 11. 1" OOF 6.50 CURB AND GUTTER, SEE SHEET C5.0 DETAIL 19 FOR MORE SPECIFICATIONS, INSTALLED BY CONTRACTOR.

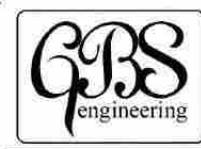
- GENERAL PAVING NOTES**
01. ALL MANHOLES LIDS MUST BE SET FLUSH WITH ADJACENT PAVERS.
 02. SUB GRADE MUST BE COMPACTED TO 95% STANDARD PROCTOR WITH A WATER CONTENT WITHIN 1.5% OF OPTIMUM.
 03. STONE BASE MUST BE COMPACTED TO 90% STANDARD PROCTOR WITH A WATER CONTENT WITHIN 1.5% OF OPTIMUM.



7 SITE PAVING PLAN
Scale: 1" = 20'-0"



SEE COVER SHEET FOR LEGEND.



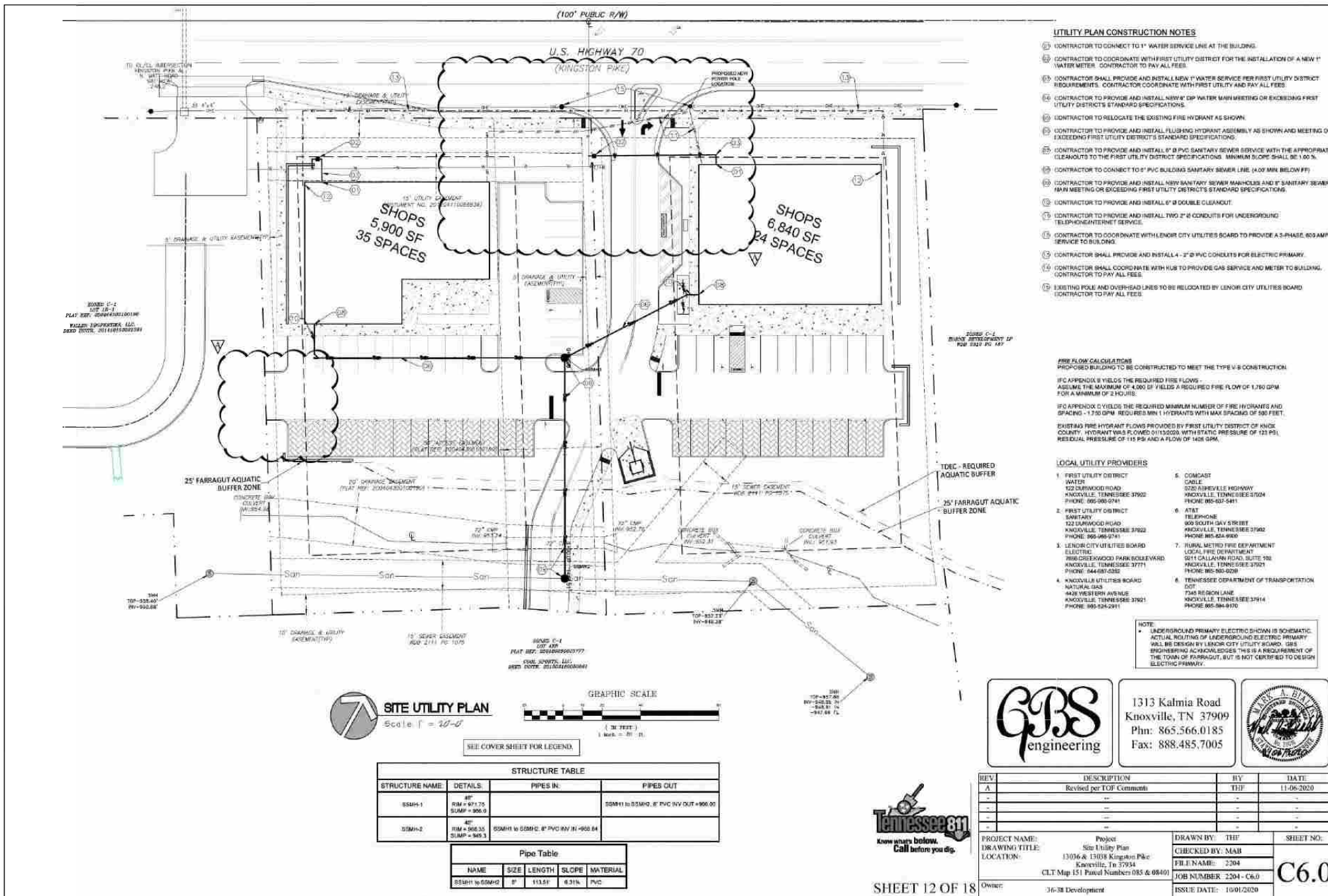
1313 Kalmia Road
Knoxville, TN 37909
Phn: 865.566.0185
Fax: 888.485.7005



REV.	DESCRIPTION	BY	DATE
A	Revised per TOP Comments	THF	11/06/2020
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
PROJECT NAME: 13036 & 13038 Kingston Pike			
DRAWING TITLE: Site Paving Plan			
LOCATION: 13036 & 13038 Kingston Pike			
Knoxville, TN 37934			
CLT Map 151 Parcel Numbers 085 & 08401			
Owner: 16-38 Development		DRAWN BY: THF	
		CHECKED BY: MAB	
		FILE NAME: 2204	
		JOB NUMBER: 2204 - C5.0	
		ISSUE DATE: 10/01/2020	

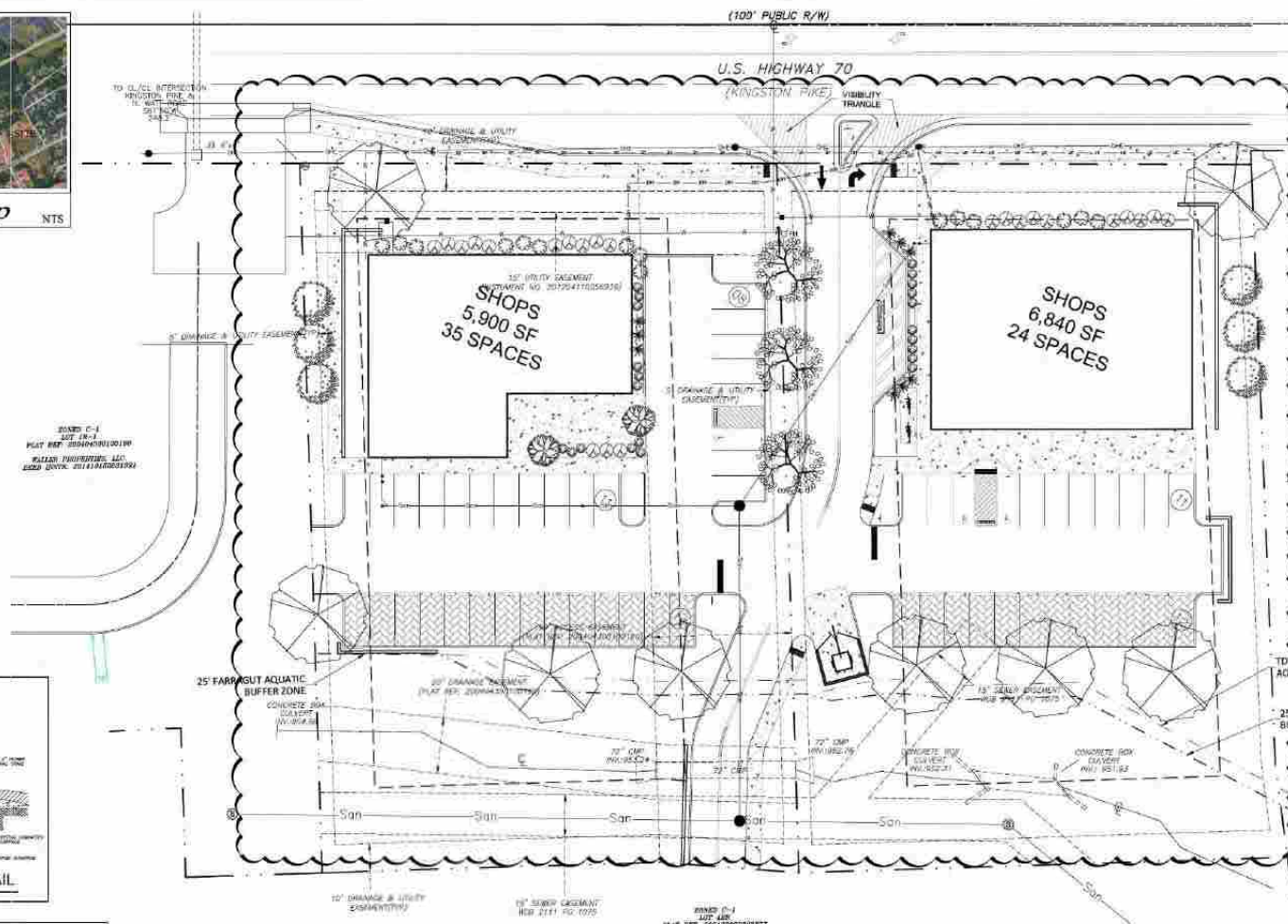
SHEET 11 OF 18

C5.0



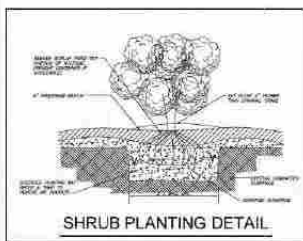


Vicinity Map NTS

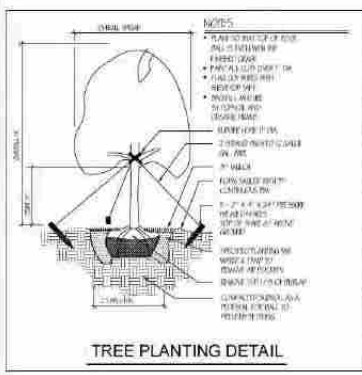


- LANDSCAPE NOTES
- 1) THERE ARE NO OVERHEAD UTILITIES WITHIN THE BOUNDARIES OF THE PROPERTY. ALL UNDERGROUND UTILITIES SHALL BE VERIFIED BEFORE ANY DIGGING OR EXCAVATION.
 - 2) THIS PROPERTY IS ZONED C-1. PROPERTIES TO EAST AND WEST ARE C-1. PROPERTY SOUTH IS R-2 AND PROPERTY NORTH IS R-2. 25' AQUATIC USE BUFFER SHALL NOT BE DISTURBED, AND SHALL FILL PLANT THE BUFFER PLANTING REQUIRED BETWEEN C-1 AND R-2.
 - 3) THIS PLAN REFLECTS AND IS CONSISTENT WITH THE REMAINING PLAN SHEETS ASSOCIATED WITH THIS PROJECT.
 - 4) ALL FINISHED LAWN AREAS SHALL HAVE A MINIMUM OF 4" TOP SOIL SMOOTHLY AND EVENLY DISTRIBUTED. TOPSOIL SHALL BE FREE OF DEBRIS AND NOXIOUS MATERIALS, AND SHALL HAVE POSITIVE DRAINAGE IN ALL LOCATIONS.
 - 5) NO FINISHED GRADE SLOPE WILL BE STEEPER THAN 3:1.
 - 6) ALL DISTURBED AREAS REMAINING THAT ARE NOT LANDSCAPED WITH PLANT MATERIAL ARE TO BE GRASSED.
 - 7) ALL PLANTS SHALL BE FREE OF DISEASE, AND SHALL HAVE A HEALTHY APPEARANCE AT PLANTING.
 - 8) ALL PLANT SEEDS ARE TO RECEIVE A 3" LAYER OF HARDWOOD MULCH.
 - 9) ALL PLANT GROWTH IN LANDSCAPED AREAS SHALL BE CONTROLLED BY PRUNING, TRIMMING, OR OTHER SUITABLE METHODS SO THAT PLANT MATERIALS DO NOT INTERFERE WITH UTILITIES, RESTRICT PEDESTRIAN OR VEHICULAR ACCESS, OR OTHERWISE CONSTITUTE A TRAFFIC HAZARD.
 - 10) ALL LANDSCAPED AREAS SHALL BE MAINTAINED IN RELATIVELY WEED-FREE CONDITION AND CLEAN OF LITTER/DROPPINGS.
 - 11) ALL PLANTINGS SHALL BE FERTILIZED AND IRRIGATED AT INTERVALS AS ARE NECESSARY TO PROMOTE OPTIMAL GROWTH.
 - 12) ALL TREES, SHRUBS, GROUND COVER, AND OTHER PLANT MATERIALS SHALL BE REPLACED IF THEY DIE OR BECOME UNHEALTHY DUE TO ACCIDENTS, DRAINAGE PROBLEMS, DISEASE, OR OTHER CAUSES.
 - 13) NO DETENTION OR RETENTION WATER BASINS ARE REQUIRED.
 - 14) NO GRADING WILL OCCUR WITHIN THE REQUIRED LANDSCAPE BUFFER, OTHER THAN INSTALLATION OF UTILITIES.
 - 15) TREE PROTECTIVE FENCING SHALL BE PLACED ALONG THE 25' FARRAGUT AQUATIC USE BUFFER TO PROTECT ALL EXISTING TREES.

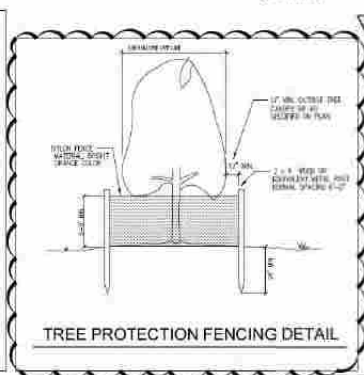
SITE:	2.00 ACRES	87,179.13 SF
TOTAL NON-LANDSCAPED AREA:	44,917.36 SF	
TOTAL IMPERVIOUS AREA:	40,354.00 SF (46.34% IMP)	175 (40)
TOTAL:	46.31% IMPERVIOUS	
1 SHADE TREE (2000 S.F. NON PLANTED AREA ON SITE 44,917.36 SF)		
NON-PLANTED AREA ON SITE 44,917.36 SF		
(44,917.36 / 2500) = 17.97 (18)		
TREES REQUIRED: 18 - TREES PROVIDED: 8 (8 NEW)		
102% MUST REACH 30' HEIGHT AND WIDTH 4" SHADE (100%)		
8 EVERGREENS SUBSTITUTED		
3 REDUDES SUBSTITUTED		



SHRUB PLANTING DETAIL



TREE PLANTING DETAIL



TREE PROTECTION FENCING DETAIL



SITE LANDSCAPING PLAN Scale: 1" = 20'-0"

SEE COVER SHEET FOR LEGEND.

SYMBOL	PLANT NAME	COMMON NAME	MINIMUM SIZE	QUANTITY	TYPE
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB
○	ORNAMENTAL	ORNAMENTAL	2" CALIBER	2	SHRUB



SHEET 13 OF 18

GBS
engineering

1313 Kalmia Road
Knoxville, TN 37909
Phn: 865.566.0185
Fax: 888.485.7005



REV	DESCRIPTION	BY	DATE
A	Revised per TOP Comments	THP	11/06/2020

PROJECT NAME:	13036 & 13038 Kingston Pike	DRAWN BY:	THP	SHEET NO:
DRAWING TITLE:	Site Landscaping Plan	CHECKED BY:	MAB	
LOCATION:	13036 & 13038 Kingston Pike Knoxville, TN 37904 CLT Map 151 Parcel Numbers 085 & 08404	FILE NAME:	2204	
OWNER:	36-38 Development	JOB NUMBER:	2204 - C7.0	
		ISSUE DATE:	10/01/2020	

C7.0



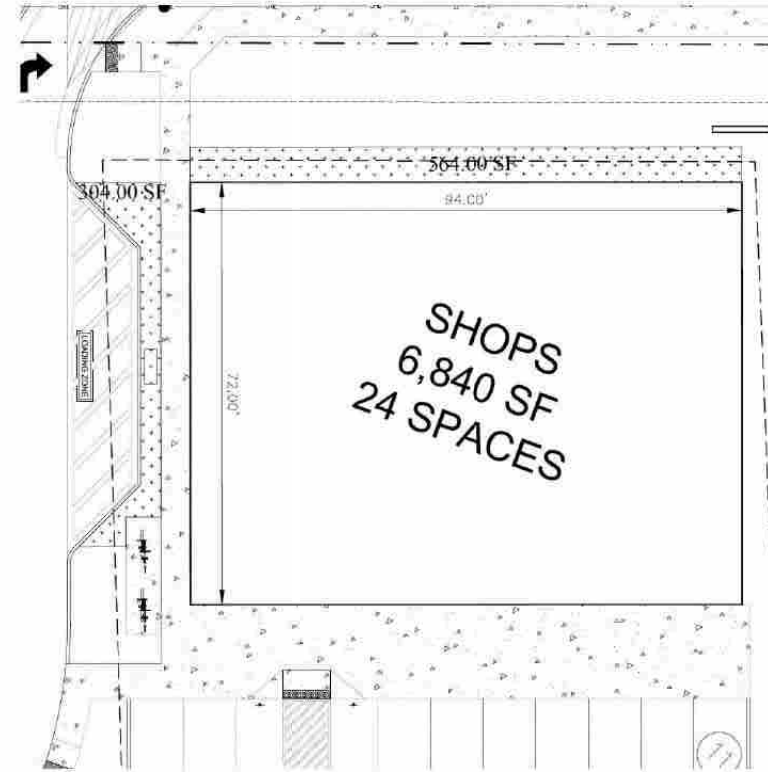
LANDSCAPE CALCULATIONS:
 REQUIRED LANDSCAPE AREA
 LINEAR FOOTAGE OF BUILDING x 2.5' =
 283 LF x 2.5 = 657.50 SF REQUIRED
 PROVIDED LANDSCAPE AREA = 813.58 SF



BUILDING PERIMETER LANDSCAPING

Scale: 1" = 10'-0"

SEE COVER SHEET FOR LEGEND.



LANDSCAPE CALCULATIONS:
 REQUIRED LANDSCAPE AREA
 LINEAR FOOTAGE OF BUILDING x 2.5' =
 280 LF x 2.5 = 650 SF REQUIRED
 PROVIDED LANDSCAPE AREA 564.00 + 304.00 = 868 SF



(SITE LANDSCAPE PLAN PREPARED BY TRAVIS FERRILL
 (DESIGNER WITH BACHELORS DEGREE IN LANDSCAPE DESIGN))



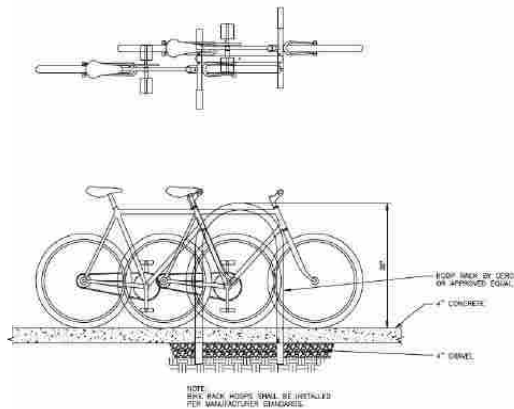
1313 Kalmia Road
 Knoxville, TN 37909
 Phn: 865.566.0185
 Fax: 888.485.7005



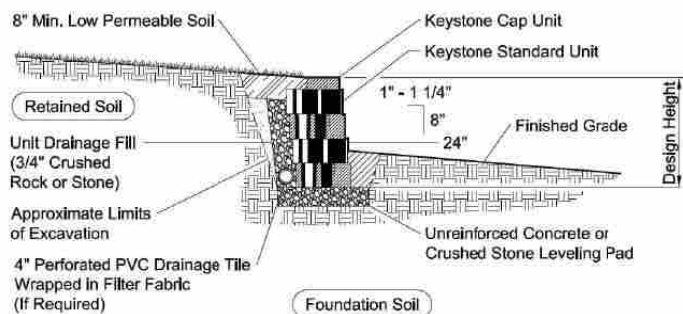
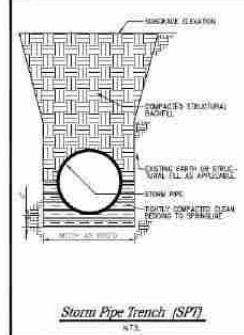
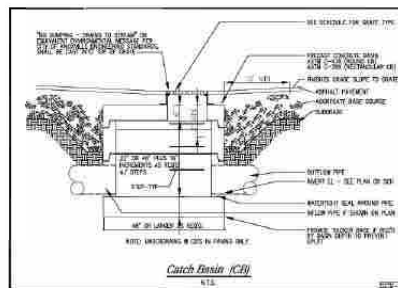
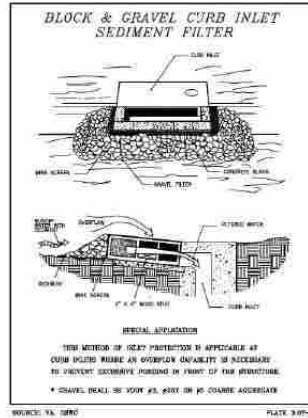
SHEET 14 OF 18

REV.	DESCRIPTION	BY	DATE
1	13036 & 13038 Kingston Pike	THP	
2	Site Landscaping Plan	MAB	
3	13036 & 13038 Kingston Pike		
4	Knoxville, TN 37934		
5	CLT Map 151 Parcel Numbers 085 & 08401		
6	Owner: 36-38 Development		
7	Drawn By: THP		
8	Checked By: MAB		
9	File Name: 2204		
10	Job Number: 2204 - C7.0		
11	Issue Date: 10/01/2020		

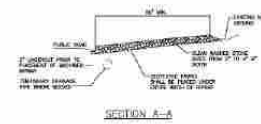
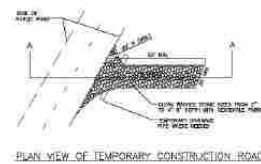
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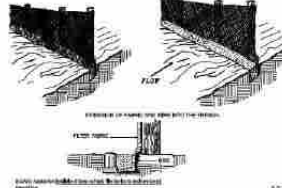
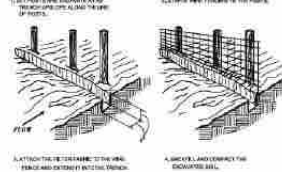
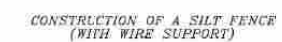
BIKE RACK DETAILS
NTS



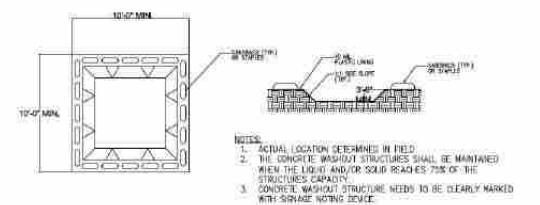
GENERIC RETAINING WALL DETAIL
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CONSTRUCTION EXIT
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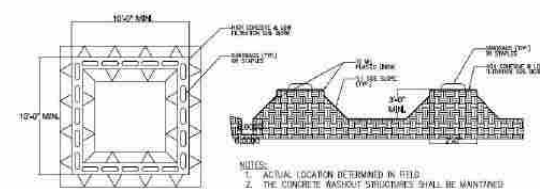


SILT FENCE WITH WIRE SUPPORT
NTS



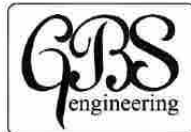
- NOTES:
1. ACTUAL LOCATION DETERMINED IN FIELD.
 2. THE CONCRETE WASHOUT STRUCTURES SHALL BE MAINTAINED WHEN THE LIQUID AND/OR SOLID REACHES 75% OF THE STRUCTURES CAPACITY.
 3. CONCRETE WASHOUT STRUCTURE NEEDS TO BE CLEARLY MARKED WITH SIGNAGE NOTING DEVICE.

DESIGN GRADE WASHOUT STRUCTURE
NTS



- NOTES:
1. ACTUAL LOCATION DETERMINED IN FIELD.
 2. THE CONCRETE WASHOUT STRUCTURES SHALL BE MAINTAINED WHEN THE LIQUID AND/OR SOLID REACHES 75% OF THE STRUCTURES CAPACITY TO PROVIDE ADEQUATE HOLDING CAPACITY WITH A MINIMUM 12 INCHES OF PROTECTION.
 3. CONCRETE WASHOUT STRUCTURE NEEDS TO BE CLEARLY MARKED WITH SIGNAGE NOTING DEVICE.

ADJUSTED GRADE WASHOUT STRUCTURE
NTS



1313 Kalmia Road
Knoxville, TN 37909
Phn: 865.566.0185
Fax: 888.485.7005



REV	DESCRIPTION	BY	DATE
A	Revised per Town of Farragut Comments	MAB	11/06/2020
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-	-	-	-
-	-	-	-
-	-	-	-
PROJECT NAME: 13036 & 13038 Kingston Pike			
DRAWING TITLE: Detail Sheet			
LOCATION: 13036 & 13038 Kingston Pike			
Knoxville, TN 37954			
CLT Map 151 Parcel Number 085 & 08401			
Owner: 36-38 Development		DRAWN BY: THF	
		CHECKED BY: MAB	
		FILE NAME: 2304	
		JOB NUMBER: 2204-C8.0	
		ISSUE DATE: 10/01/2020	

C8.0



PERSPECTIVE VIEW



PERSPECTIVE VIEW



WEST ELEVATION
SCALE 1/8"=1'-0"



SOUTH ELEVATION
SCALE 1/8"=1'-0"



EAST ELEVATION
SCALE 1/8"=1'-0"



NORTH ELEVATION
SCALE 1/8"=1'-0"

SPEC BUILDING EXTERIOR ELEVATIONS
13036 KINGSTON PIKE



PERSPECTIVE VIEW



PERSPECTIVE VIEW



WEST ELEVATION
SCALE 1/8"=1'-0"



SOUTH ELEVATION
SCALE 1/8"=1'-0"



EAST ELEVATION
SCALE 1/8"=1'-0"



NORTH ELEVATION
SCALE 1/8"=1'-0"

SPEC BUILDING EXTERIOR ELEVATIONS

SHEET 18 OF 18

REPORT TO THE FARRAGUT MUNICIPAL PLANNING COMMISSION

PREPARED BY: Bart Hose, Assistant Community Development Director

SUBJECT: Discussion and public hearing on a concept plan for the Meadows on McFee, 933 and 1013 McFee Road, Zoned R-1/OSR, 32 Acres, 59 Lots (Homestead Land Holdings, LLC, Applicant)

INTRODUCTION AND BACKGROUND: This request involves a concept plan for the proposed Meadows on McFee Subdivision. The property in question includes the former Gibson Farm property and a portion of the Velma Seal property. The Gibson Farm portion of the property was rezoned by the Board of Mayor and Aldermen last month. The Board is considering the same R-1/OSR zoning for the Seal property area this month.

DISCUSSION: The proposed subdivision includes 59 building lots, a main loop street configuration with two (2) access points along McFee Road, and open-space areas. The proposed internal street/transportation system also includes both street and walking trail connections to the properties located to the north and south of the project.

RECOMMENDATION: Included in your packet is the applicant's revised concept plan. Staff will make a recommendation at the meeting based on whether and how the applicant has addressed all initial staff comments. Any approval will need to be made subject to the final rezoning of the Seal property noted above.

CONCEPT PLAN

THE MEADOWS ON MCFEE

FARRAGUT, TN

CONCEPTUAL: NOT FOR CONSTRUCTION



1013 MCFEE RD & 933 MCFEE RD, FARRAGUT, TN 37934
CLT MAP 162 PARCELS 019 & 014.04
32 ACRES

OCTOBER 19, 2020
REVISED: NOVEMBER 9, 2020

TABLE OF CONTENTS	
1	TITLE PAGE
2	CP-01 EXISTING SITE FEATURES
3	CP-02 CONCEPT LAYOUT
4	CP-03 STRESCAPING PLAN
5	CP-04 ROAD PLAN AND PROFILE
6	CP-05 ROAD PLAN AND PROFILE
7	CP-06 ROAD PLAN AND PROFILE
8	CP-07 DETAILS

DEVELOPER:
HOMESTEAD LAND HOLDINGS, LLC
BOB MOHNEY
122 PERIMETER PARK DR
KNOXVILLE, TN 37922
865-392-5630
bmohney@saddlebrookproperties.com

UTILITIES:
FUD WATER
FUD SEWER
KUB GAS
LCUB ELECTRIC
TDS COMMUNICATIONS

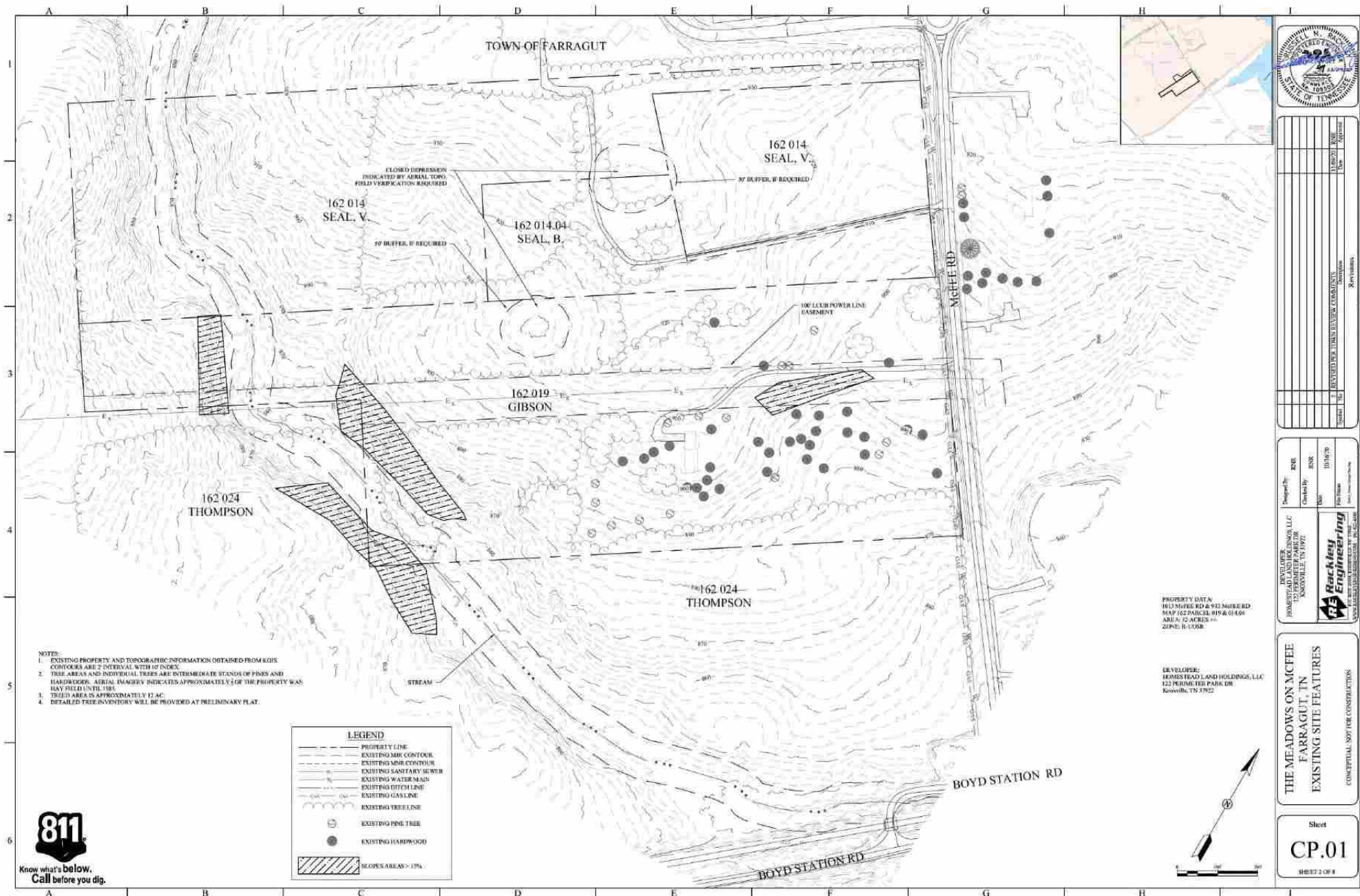
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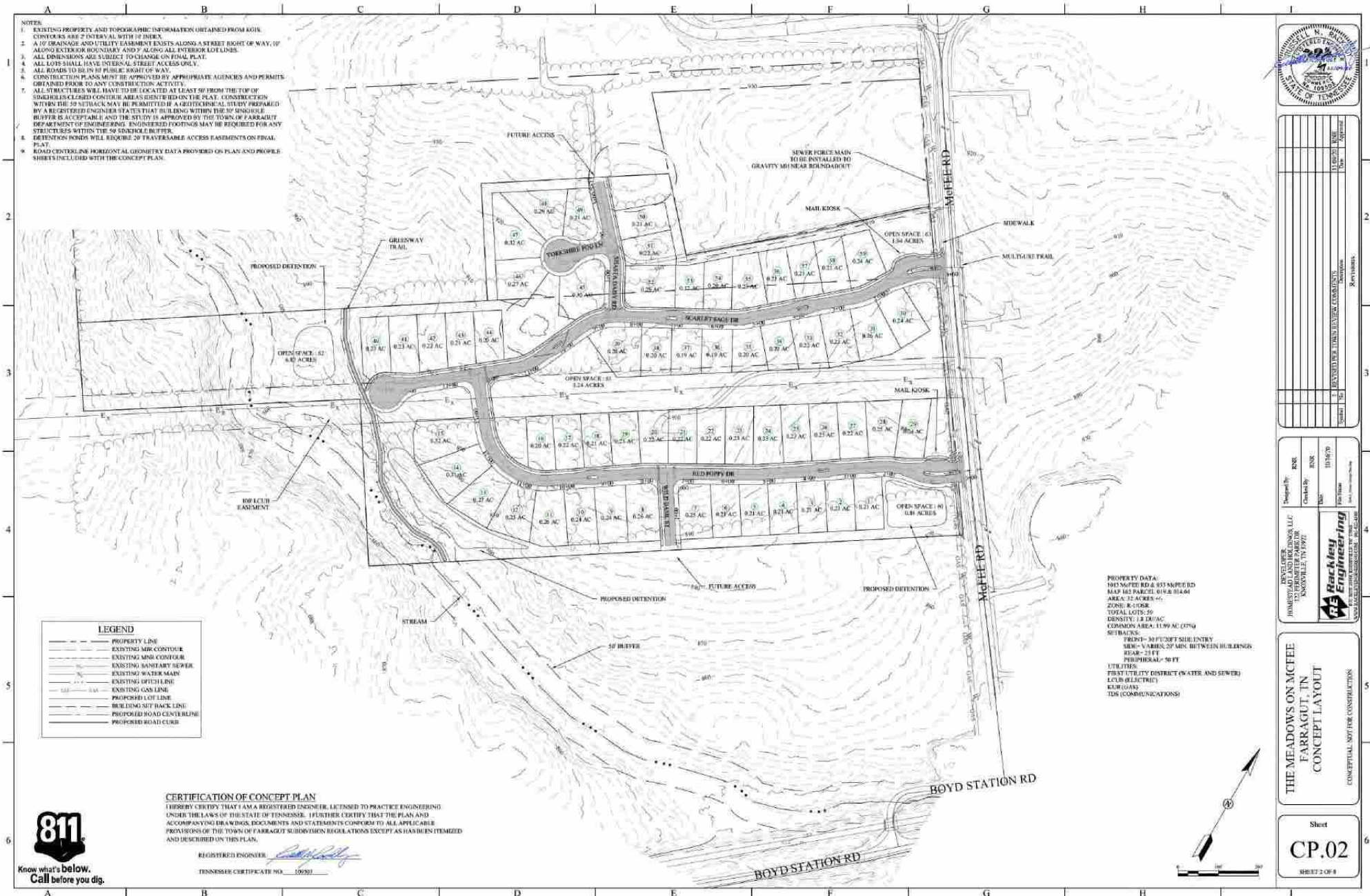


P.O. BOX 30456, KNOXVILLE, TN, 37930
WWW.RACKLEYENGINEERING.COM 865-622-6560
mrackley@rackleyengineering.com



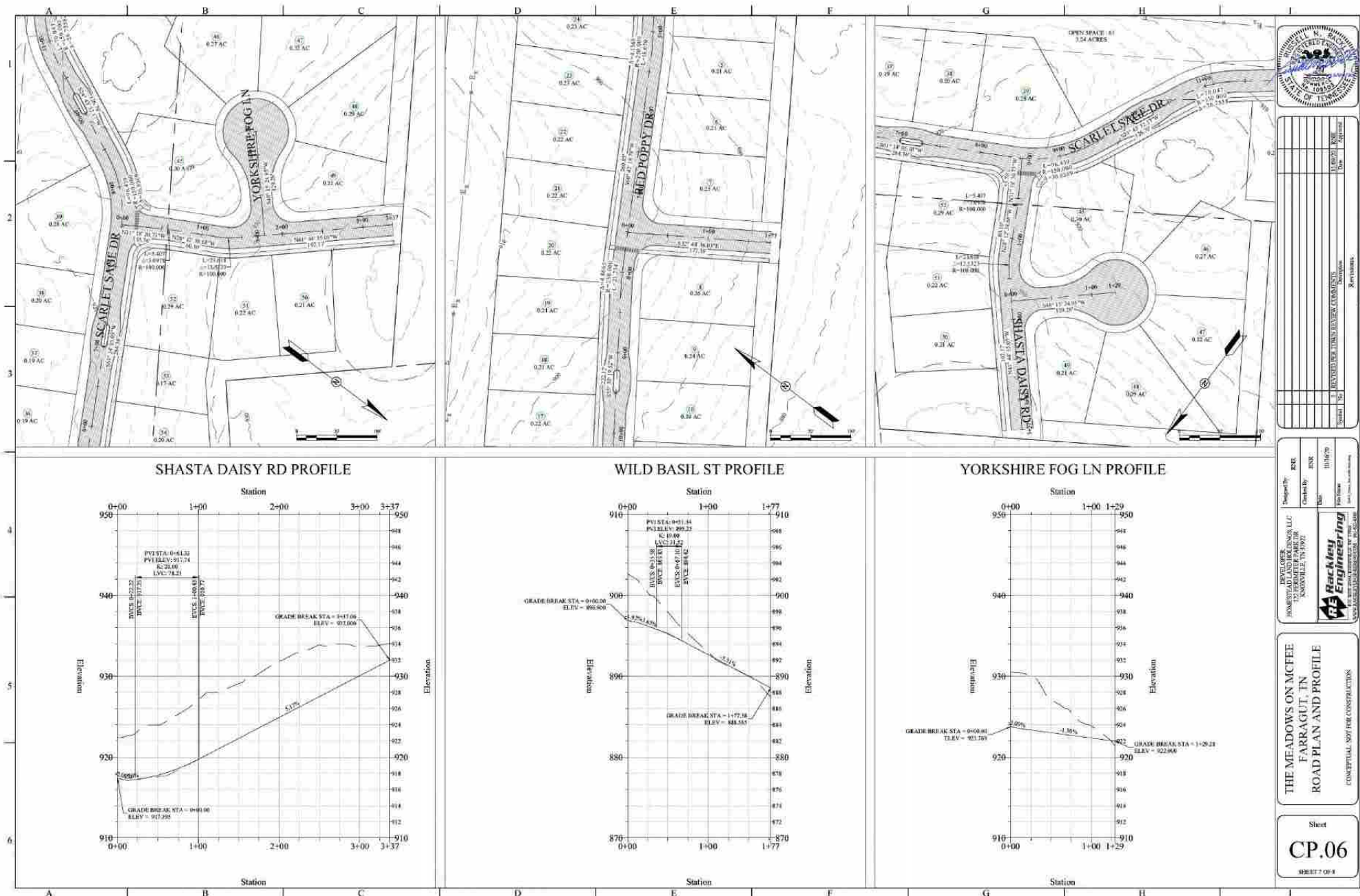
SHEET 1 OF 8

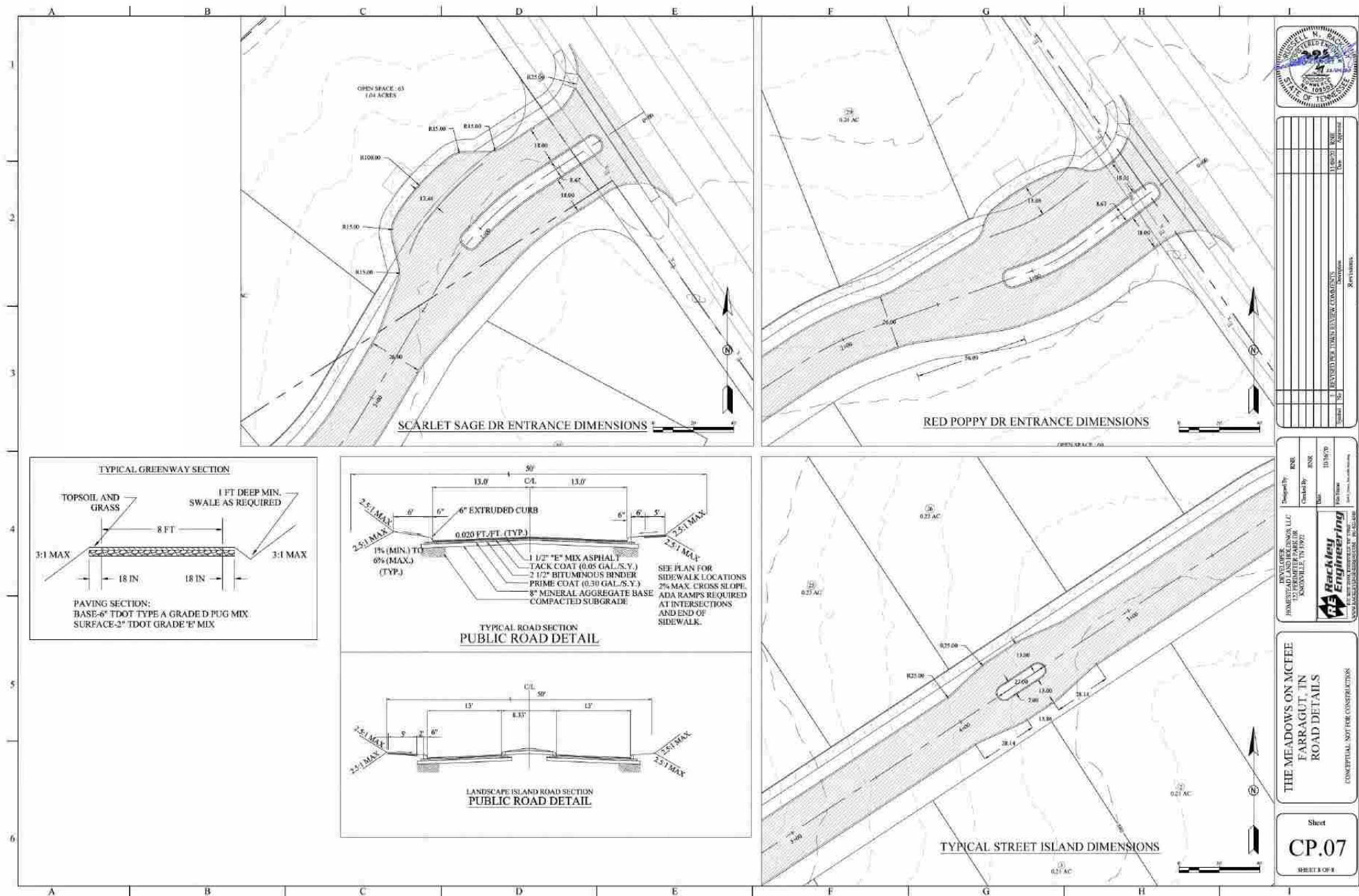












REPORT TO THE FARRAGUT MUNICIPAL PLANNING COMMISSION

PREPARED BY: Mark Shipley, Community Development Director

SUBJECT: Discussion and public hearing on a request to amend Appendix A – Zoning, Chapter 3., Specific District Regulations, Section XII., General Commercial District (C-1), B., 3., as it relates to the outdoor display and or storage of general farm implements and lawn care equipment, riding lawn mowers, and related accessories (Farragut Lawn and Tractor, Applicant)

INTRODUCTION AND BACKGROUND: This item was discussed last month and is related to provisions in the Farragut Zoning Ordinance that address outdoor display and storage of general farm implements and lawn care equipment, riding lawn mowers, and related accessories. Staff reviewed the current provisions which were specifically created for this type of use. Essentially, the current provisions limit display to a permanent covered porch that extends from the front of the building toward Kingston Pike.

DISCUSSION: As staff noted in the review of this item, the issue has been that the property owner has not been adhering to the current provisions and has recently been cited to municipal court and found liable for violating these provisions. Consequently, the property owner petitioned for the existing language to be re-visited. After reviewing this with the Commission in October, staff was asked to meet with the property owner on site and look at where equipment could be displayed beyond the limits of the current provisions so that the setbacks could be established in the text amendment.

On November 5, staff visited Farragut Lawn and Tractor. After discussing different options, staff is proposing in Ordinance 20-25 that the outdoor storage and/or display of implements and/or equipment shall be situated so that such storage or display is at least 20 feet from the front property line. It will be the responsibility of the property owner to coordinate with Town staff on identifying and marking the 20-foot setback line for clarity and compliance purposes.

The rationale for the 20-foot setback is that this is the same minimum setback for parking lots. So, equipment being stored or displayed would be in the same general location in relation to the abutting street as cars parked in a parking lot. This setback line will have to be identified and marked in consultation with the Town staff so that compliance with the amended provisions can be easily assessed.

As discussed in October, no equipment shall be permitted at any time on sidewalks or accessways and all signage shall comply with the Farragut Sign Ordinance.

RECOMMENDATION: Included in your packet is Resolution PC-20-17 which recommends approval of Ordinance 20-25.

RESOLUTION PC-20-17

FARRAGUT MUNICIPAL PLANNING COMMISSION

A RESOLUTION TO AMEND THE TEXT OF THE FARRAGUT ZONING ORDINANCE, ORDINANCE 86-16, AS AMENDED, PURSUANT TO AUTHORITY GRANTED BY SECTION 13-4-201, TENNESSEE CODE ANNOTATED, BY AMENDING THE FARRAGUT MUNICIPAL CODE, APPENDIX A., ZONING, CHAPTER 3., SPECIFIC DISTRICT REGULATIONS, SECTION XII., GENERAL COMMERCIAL DISTRICT (C-1), B., 3., AS IT RELATES TO THE OUTDOOR DISPLAY AND OR STORAGE OF GENERAL FARM IMPLEMENTS AND LAWN CARE EQUIPMENT, RIDING LAWN MOWERS, AND RELATED ACCESSORIES

WHEREAS, the Tennessee Code Annotated, Section 13-4-201 et seq, provides that the Municipal Planning Commission shall make and adopt a general plan for the physical development of the municipality; and

WHEREAS, the Farragut Municipal Planning Commission has adopted various elements of a zoning plan as an element of the general plan for physical development; and

WHEREAS, a public hearing was held on this request on November 19, 2020;

NOW, THEREFORE, BE IT RESOLVED that the Farragut Municipal Planning Commission hereby recommends approval to the Farragut Board of Mayor and Aldermen of an ordinance, amending Ordinance 86-16, of the Farragut Zoning Ordinance, by adding Ordinance 20-25.

ADOPTED this 19th day of November 2020.

Rita Holladay, Chairman

Scott Russ, Secretary

ORDINANCE:	20-25
PREPARED BY:	Shipley
REQUESTED BY:	Farragut Lawn and Tractor
1ST READING:	_____
2ND READING:	_____
PUBLISHED IN:	_____
DATE:	_____

AN ORDINANCE TO AMEND THE TEXT OF THE FARRAGUT ZONING ORDINANCE, ORDINANCE 86-16, AS AMENDED, PURSUANT TO AUTHORITY GRANTED BY SECTION 13-4-201, TENNESSEE CODE ANNOTATED, BY AMENDING THE FARRAGUT MUNICIPAL CODE, APPENDIX A., ZONING, CHAPTER 3., SECTION XII. B., 3., RETAIL OUTLETS FOR THE SALE OF GENERAL FARM IMPLEMENTS AND LAWN CARE EQUIPMENT SUCH AS TRACTORS (LESS THAN 10,000 POUNDS), RIDING LAWN MOWERS, AND RELATED ACCESSORIES

WHEREAS, the Board of Mayor and Aldermen of the Town of Farragut, Tennessee, wishes to amend Chapter 3., Section XII. B., 3., Retail outlets for the sale of general farm implements and lawn care equipment such as tractors (less than 10,000 pounds), riding lawn mowers, and related accessories, of the Farragut Zoning Ordinance, Ordinance 86-16,

NOW, THEREFORE, BE IT ORDAINED by the Board of Mayor and Aldermen of the Town of Farragut, Tennessee, that the Farragut Zoning Ordinance is hereby amended by replacing it in its entirety as follows:

SECTION 1.

Section XII. B., 3., Retail outlets for the sale of general farm implements and lawn care equipment such as tractors (less than 10,000 pounds), riding lawn mowers, and related accessories.

3. Retail outlets for the sale of general farm implements and lawn care equipment such as tractors (less than 10,000 pounds), riding lawn mowers, and related accessories.
 - a. The outdoor display and/or storage of such implements and equipment shall be permitted provided the following development criteria are met:
 - (1) The outdoor storage and/or display of the implements and/or equipment shall be situated so that it is at least 20 feet from the front property line. It is the responsibility of the property owner to coordinate with Town staff on identifying and marking the 20-foot setback line for clarity and compliance purposes;
 - (2) The equipment and/or implements to be stored and/or displayed outdoors must be removed from the crate or cartons and displayed and/or stored in such a way as to allow for viewing and inspection, but so as not to prevent passage on sidewalks, walkways, or other vehicle ways;
 - (3) Such businesses necessarily involve the use of outdoor areas on the premises for the unloading, uncrating, positioning and repositioning of items that are often

larger and more cumbersome than most retailers handle. The temporary use of outdoor areas of the premises for such purposes during hours of operation shall not be a violation of this ordinance; and

- (4) Such businesses necessarily utilize packaging that is to be destroyed or reused. Such packaging materials shall be stored in areas on the premises to which access shall be restricted by means of a physical barrier such as an opaque fence or similar to a dumpster enclosure and shall comply with Chapter 4, Section I.B. of this ordinance.

SECTION 2.

This ordinance shall take effect from and after its final passage and publication, the public welfare requiring it.

Ron Williams, Mayor

Allison Myers, Town Recorder

Certified to the Farragut Board of Mayor and Aldermen this ____ day of _____, 2020, with approval recommended.

Rita Holladay, Chairman

Scott Russ, Secretary

FARRAGUT MUNICIPAL PLANNING COMMISSION

Sec. XII. - General commercial district (C-1).

- A. *General description.* This district provides space for commercial uses which provide services primarily to community residents of the Town of Farragut. The intent is to permit lands adjacent to major arterial highways as designated by the Farragut Major Road Plan to be used for the provision of general commercial and business services to the community. These commercial uses are intended to be designed to minimize disruption of traffic flows and negative impacts on adjacent residential uses.
- B. *Permitted principal and accessory uses and structures (Non-Mixed Use Town Center as identified in the Comprehensive Land Use Plan).* Unless provided for elsewhere in this section, property and structures located in the General Commercial District (C-1) shall be used only for the following purposes:

1. Generally recognized retail sales. This excludes flea markets and the sale of automobiles and the sale and/or rental of boats, trucks, trailers, construction equipment, mobile homes, and other similar uses as determined by the Board of Zoning Appeals.

The outdoor sale and/or storage of merchandise and/or any other materials shall be permitted provided the following development criteria are met:

- a. Such merchandise and/or materials are displayed or stored in a permanent area designed for such use;
 - b. Such merchandise and/or materials are not displayed or stored on any sidewalks, walkways, parking spaces, or other vehicle ways;
 - c. Required yard setbacks for buildings are met for the storage/display area;
 - d. Access to the display/storage area shall be restricted by means of a physical barrier such as a fence, a berm, landscaping, or other similar means; and
 - e. The total area reserved for outdoor display/storage shall not exceed 2,000 square feet if the net indoor retail floor area is greater than 25,000 square feet, and it shall not exceed 1,000 square feet if the net indoor retail floor area is less than 25,000 square feet.
2. The retail sale of alcoholic beverages, as provided for in the Farragut Municipal Code.
 3. Retail outlets for the sale of general farm implements and lawn care equipment such as tractors (less than 10,000 pounds), riding lawn mowers, and related accessories.
 - a. The outdoor display and/or storage of such implements and equipments-shall be permitted provided the following development criteria are met:
 - (1) The outdoor storage and/or display of the implements and/or equipment shall be situated so that it is at least 20 feet from the front property line. It is the responsibility of the property owner to coordinate with Town staff on identifying and marking the 20-foot setback line for clarity and compliance purposes. ~~lie behind a straight line running from side lot line to side lot line that coincides with the rear wall of the principal building located on the property;~~
 - (2) The equipment and/or implements to be stored and/or displayed outdoors must be removed from the crate or cartons and displayed and/or stored in such a way as to allow for viewing and inspection, but so as not to prevent passage on sidewalks, walkways, or other vehicle ways;
 - (3) Such businesses necessarily involve the use of outdoor areas on the premises for the unloading, uncrating, positioning and repositioning of items that are often larger and more cumbersome than most retailers handle. The temporary use of outdoor areas of the premises for such purposes during hours of operation shall not be a violation of this ordinance; and

- (4) Such businesses necessarily utilize packaging that is to be destroyed or reused. Such packaging materials shall be stored in areas on the premises to which access shall be restricted by means of a physical barrier such as an opaque fence or similar to a dumpster enclosure and shall comply with Chapter 4, Section I.B. of this ordinance.
- ~~b. The outdoor display of merchandise, except as provided for above, is permitted provided such merchandise is displayed in a permanent, covered porch. Such covered porch shall be attached to the principal building and shall meet all setback requirements of the principal building.~~
4. Financial and real estate services.
 5. Professional, personal, and business services.
 6. Restaurants, tea rooms, cafes, coffee houses, or other similar establishments serving food or beverage that is primarily consumed within the principal building or in designated outdoor seating areas associated with the principal building.

Coffee houses with drive-through service lanes that serve as the principal means for service. The principal location for consumption is offsite.
 7. Automotive services, provided such services are for automobiles and light trucks only. Such services may include fuel sales and repairs. Facilities designed to accommodate the refueling and/or servicing of trucks with more than three axles or more than ten wheels are prohibited.
 8. Retail rental and leasing of automobiles provided the following development criteria are met:
 - a. Such business is located in a freestanding building; and
 - b. If the premises are fenced, such fencing shall be decorative, shall not exceed three feet in height, and shall be of such design so as not to prevent the ability to see through the fence.
 9. Public, governmental, and general offices.
 10. Medical, dental, and veterinary facilities.
 11. Medical spas.
 12. Commercial kennels, provided the following development criteria are met:
 - a. Any outdoor structures (e.g., fences) associated with the kennel shall not be visible from public streets;
 - b. Boarding of animals shall be confined to the interior of a structure designated for this purpose;
 - c. Outdoor fences are permitted solely to provide an area for exercise and waste elimination and shall be used only with on-site supervision. Outdoor fences shall adhere to the following specifications:
 1. Opaque with no openings as viewed from the outside of the fence and a minimum of six feet in height;
 2. Properly maintained and constructed of durable, low maintenance materials that are earth tone, black, or white in color and contain no signage. No chain link fencing shall be permitted;
 3. Set back at least 50 feet from an adjacent property that is not zoned residential or agriculture. Such measurement shall be a straight line distance from the nearest portion of the fence to the nearest portion of the property that is not zoned residential or agriculture;
 4. Set back at least 250 feet from an adjacent property that is zoned residential or agriculture. Such measurement shall be a straight line distance from the nearest

REPORT TO THE FARRAGUT MUNICIPAL PLANNING COMMISSION

PREPARED BY: Bart Hose, Assistant Community Development Director

SUBJECT: Discussion on a rezoning of property situated around the eastern intersection of McFee Road and Boyd Station Road, Parcels 50, 50.01, 54.01, and 9.01, Tax Map 162, 12611 Boyd Station Road, from General Single-Family Residential (R-2) to Open Space Mixed Residential Overlay (R-1/OSMR), 131.25 Acres (OBO Homestead Land Holdings, Applicant)

INTRODUCTION AND BACKGROUND: This rezoning request involves four separate tracts totaling 131.25 acres. The property stretches from McFee Road to Virtue Road and includes approximately 3000 linear feet of frontage along Boyd Station Road. The property also has access to McFee Road located at the southernmost traffic circle and via a small strip of land south of the circle, and to Virtue Road via the easternmost lot in question and a narrow strip of land (see Exhibit 1).

DISCUSSION: The property in question is currently agricultural and open in nature. It is primarily open fields, fence rows, and includes a small cluster of agricultural buildings. The easternmost lot is a narrow, tree covered vacant/open-space area, that is impacted by a transmission line easement and has limited frontage on Virtue Rd. The property also appears to contain several potential sinkhole areas that could impact development.

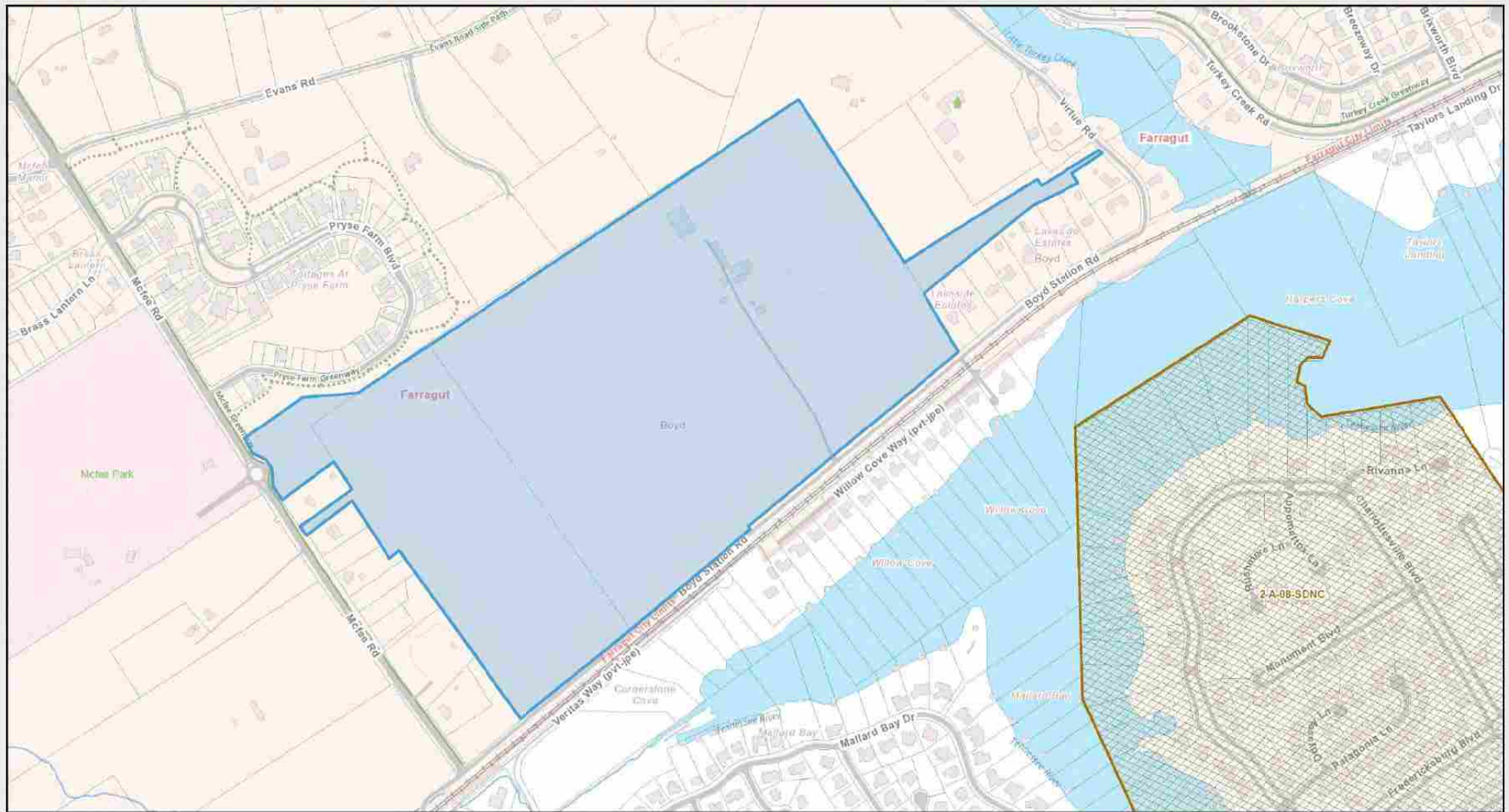
Existing land use in the area immediately around the property is largely low density residential in nature with a mix of open areas, larger residential lots and tracts, and a few public/semi-public uses. The existing Pryse Farm development is an exception to this pattern and is located immediately to the northwest of the subject property. This development can be characterized as a lower density attached single-family residential development (roughly 2.17 units per acre). The surrounding area is also experiencing development pressure and two single-family subdivisions are either under development or under review within the Town. This includes the Brass Lantern development and the Meadows on McFee development. Additional development also continues to occur south of the Town in the Choto area of Knox County (see Exhibit 2).

As noted above, the property has considerable frontage along Boyd Station Road and additional usable access to McFee Road. Access to Virtue Road is limited and likely only suitable for a pedestrian/bicycle trail connection point. McFee Road is classified as a Minor Arterial on the Town's Major Road Plan. Boyd Station Road is classified as a Major Collector and does not currently meet the Town's minimum improvement standards for a roadway of this classification. As such, it would need to be improved to the adopted complete streets cross-section in conjunction with any significant development of the property. Adequate utility services would also need to be provided to support any proposed development and existing utility mains are present in the surrounding area.

The property in question is currently zoned General Single-Family Residential (R-2) and the applicant is requesting Open Space Mixed Residential Overlay (R-1/OSMR). The Town's Future Land Use Map

identifies the area for Open Space Cluster Residential type development. The proposed zoning (R-1/OSMR) would be consistent with this land use designation. The mixed residential aspect of the requested zoning would also be consistent with the Pryse Farm development which is similarly zoned and may allow the owner/developer more flexibility in dealing with potential sinkholes and other design considerations. The mixed residential designation is, however, somewhat less consistent with the existing large lot single-family development that adjoins the property in several locations, and a recent rezoning application for OSMR on the west side of McFee Road was not approved. Given the size of the property in question, careful design could create separation and buffers between these existing homesites and any new mixed residential development (see Exhibits 3 & 4).

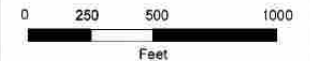
Finally, it should be noted that the property in question is currently divided into four lots/tracts. Two of these lots do not meet the 5-acre minimum area threshold for OSMR zoning and will need to be combined with the other tracts. This includes a smaller lot that adjoins the traffic circle on McFee Road and the narrow tract at the eastern end of the property that adjoins Virtue Road. These lots also provide important transportation access points for the future development of the general area. Any rezoning action should be made contingent upon these lots being formally combined with the larger tracts.



Proposed Rezoning Area

R-2 to R-1/OSMR

Parcels 50, 50.01, 54.01, 9.01; Tax Map 162



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Proposed Rezoning Area & Surrounding Development

R-2 to R-1/OSMR

Parcels 50, 50.01, 54.01, 9.01; Tax Map 162

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Exhibit 3
Proposed Rezoning Area

R-2 to R-1/OSMR
Parcels 50, 50.01, 54.01, 9.01
Tax Map 162

Legend

- Proposed Rezoning Area
- Parcels
- A, Agricultural
- OS-P, Open Space/Park
- S-1, Community Service
- R-1, Rural Single-Family Residential
- R-2, General Single-Family Residential
- R-1/OSR, Open Space Residential Overlay
- R-1/OSMR, Open Space Mixed Residential Overlay
- Telecommunication Tower Overlay Zone
- Town of Farragut Boundary

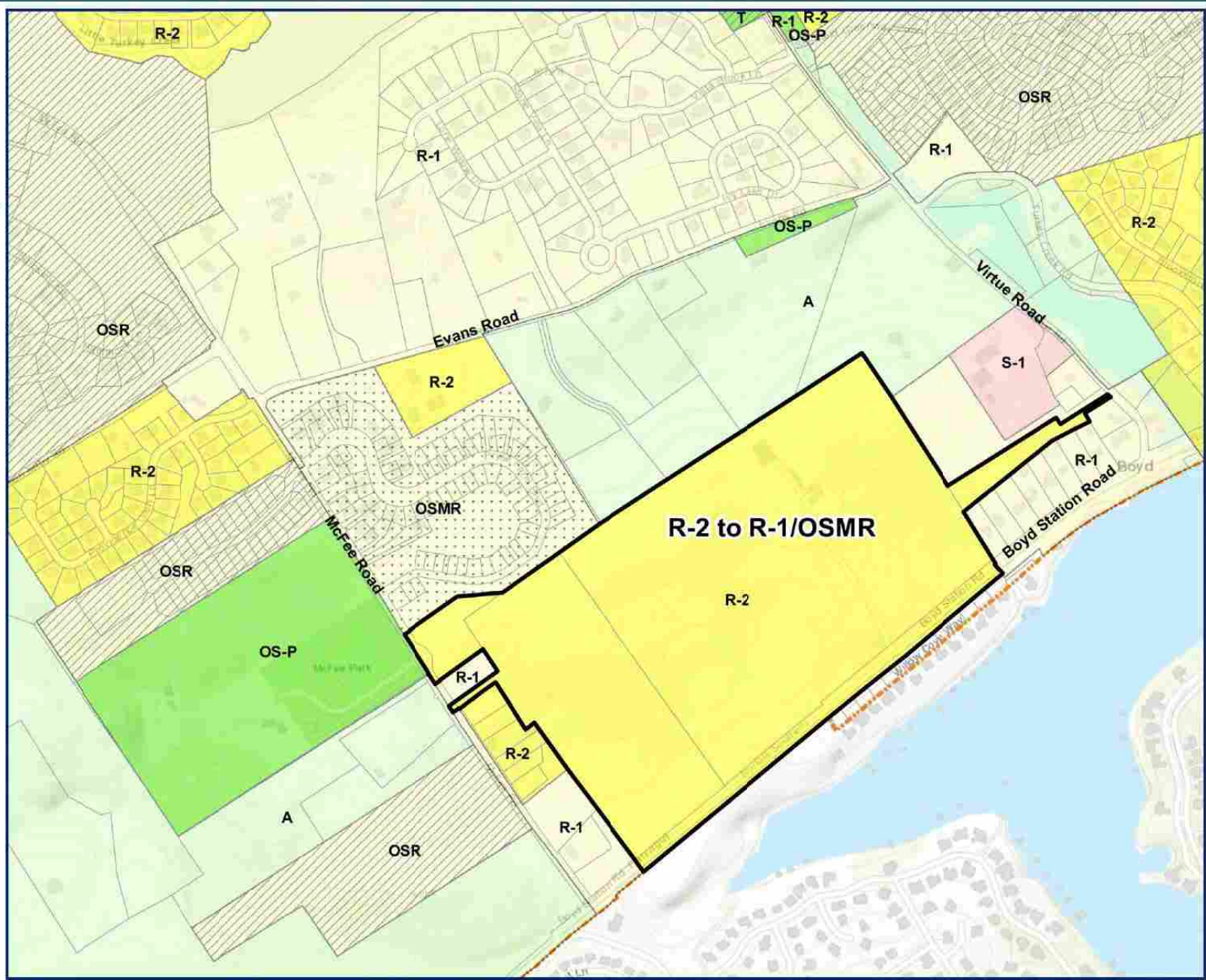


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SCALE IN FEET

CONTACTS:

GIS:
Carrie Smith
carrie.smith@aecon.com

1 inch = 600 feet
Map Prepared: 11/12/2020



Document Path: G:\FarragutMap Documents\2020\Rezoning map Proposed McFee East-Zoning.mxd



Exhibit 4
Future Land Use
Proposed Rezoning Area

R-2 to R-1/OSMR
Parcels 50, 50.01, 54.01, 9.01
Tax Map 162

Legend

- Proposed Rezoning Area
- Parcels
- Civic/Institutional
- Open Space
- Parks and Rec
- Open Space Cluster Residential
- Very Low Density Residential (2-4 DUs / Acre)
- Low Density Residential (3-6 DUs / Acre)
- Town of Farragut Boundary

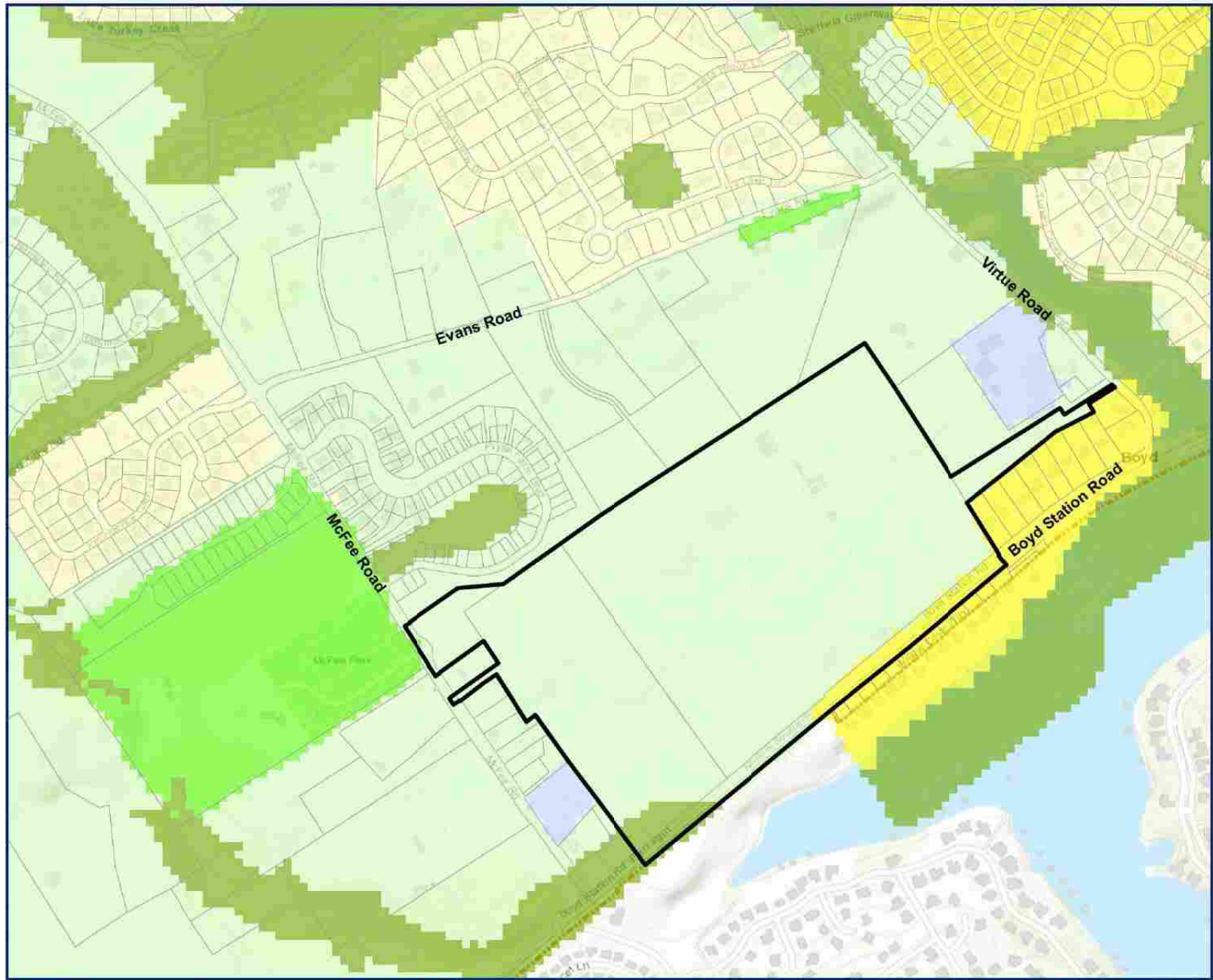


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SCALE IN FEET

CONTACTS:

GIS:
Carrie Smith
carrie.smith@aecom.com

1 inch = 600 feet
Map Prepared: 11/12/2020



Document Path: G:\FarragutMap Documents\2020\Rezoning map Proposed McFee East-FLU.mxd

REPORT TO THE FARRAGUT MUNICIPAL PLANNING COMMISSION

PREPARED BY: Mark Shipley, Community Development Director

SUBJECT: Discussion and public hearing on a request to amend the future land use map in the Comprehensive Land Use Plan Update for a portion of Parcel 003.19, Tax Map 143 (a portion of the property referenced as 133 Concord Road) associated with the Farragut Town Center at Biddle Farms project from Medium Density Residential to Town Center (CHM, LLC, Applicant)

INTRODUCTION AND BACKGROUND: This agenda item involves a project, the Town Center at Biddle Farms, that has been discussed at a number of Planning Commission and Staff/Developer meetings since March 2020. As conditionally approved through a master concept plan in July, the project would include a Town Center commercial area on the north portion of the property and transition to a multi-family residential development on the southern portion of the property with a large lawn gathering space between the two and a linear park area with a greenway loop on the eastern portion of the development along the floodplain. Collectively, this will be a Planned Commercial Development that will also involve a requested amendment to the Zoning Map.

DISCUSSION: In terms of the future land use map, most of the development proposed for the Town Center at Biddle Farms is shown in an area that is designated as Mixed-Use Town Center. A small area in the southeast portion of the development where some improvements associated with the project are planned is shown as Medium Density Residential. For consistency purposes, the applicant is requesting the area shown as Medium Density Residential be amended to Mixed Use Town Center.

One clarification to note regarding the lines shown on the future land use map is that, unlike a line on a zoning map which typically follows property lines or can be dimensioned and tied to a specific location, the lines on the future land use map are only intended to generally define areas for purposes of demonstrating a certain development vision. Thus, the lines on the future land use map may appear irregular and do not necessarily follow property lines.

In the case of the area envisioned as the Mixed Use Town Center on the future land use, the Board of Mayor and Aldermen has adopted by ordinance both the map and text portion of this particular land use designation because of its importance in encouraging the realization of Strategy 1 in the Comprehensive Land Use Plan Update which is to "Bring About a Downtown."

RECOMMENDATION: Included in your packet is Resolution PC-20-18 which recommends approval of the requested amendment to the future land use map through Ordinance 20-26. In relation to the Eight Key Strategies identified in the Comprehensive Land Use Plan Update, changing the future land use as provided for in Resolution PC-20-18 would help facilitate a project that would address the following:

1. Bringing About a Downtown (the project would create a main street with many components consistent with a downtown);

2. Repairing Aging Shopping Centers (the project would result in the removal of the old Kroger building and the creation of a new development with a town center street grid with building placement and streetscaping that encourage pedestrian activity, a large central gathering space for community events, a linear park, and improvements to outdated infrastructure);
3. Encouraging Greater Housing Choice (the project would provide for housing in a density, form, and location that would help support the downtown and create a more dynamic and active town center area);
4. Increasing Connectivity (the project includes numerous connections, both vehicular and pedestrian, that tie the project together internally and externally);
5. Enhancing our Identity (the project would create a unique type of development that would focus on activated spaces and pedestrian engagement along with provisions for public gatherings and community events); and
6. Planning for the Remaining Vacant Parcels (the project not only repairs an existing aging shopping center and infrastructure but it also addresses abutting areas and incorporates them into the project to help sustain the project and create an area that will be identified as downtown Farragut).

For these reasons, staff recommends approval of Resolution PC-20-18.

RESOLUTION PC-20-18

FARRAGUT MUNICIPAL PLANNING COMMISSION

A RESOLUTION TO APPROVE AMENDMENTS TO THE FUTURE LAND USE MAP OF THE COMPREHENSIVE LAND USE PLAN UPDATE DECEMBER 2012 FOR A PORTION OF PARCEL 003.19, TAX MAP 143 (A PORTION OF THE PROPERTY REFERENCED AS 133 CONCORD ROAD) ASSOCIATED WITH THE FARRAGUT TOWN CENTER AT BIDDLE FARMS PROJECT FROM MEDIUM DENSITY RESIDENTIAL TO MIXED USE TOWN CENTER

WHEREAS, the Tennessee Code Annotated, Section 13-4-201et seq, provides that the Municipal Planning Commission shall make and adopt a general plan for the physical development of the municipality; and

WHEREAS, the Farragut Municipal Planning Commission has adopted the Comprehensive Land Use Plan Update on December 12, 2012; and

WHEREAS, the Farragut Municipal Planning Commission may periodically amend various aspects of the Comprehensive Land Use Plan Update;

NOW, THEREFORE, BE IT RESOLVED that the Farragut Municipal Planning Commission hereby recommends, through Resolution PC-20-18, approval of Ordinance 20-26 to amend the Future Land Use Map of the Comprehensive Land Use Plan.

ADOPTED this 19th day of November 2020.

Rita Holladay, Chairman

Scott Russ, Secretary

ORDINANCE:	20-26
PREPARED BY:	Shipley
REQUESTED BY:	CHM, LLC
CERTIFIED BY FMPC:	November 19, 2020
PUBLIC HEARING:	_____
PUBLISHED IN:	_____
DATE:	_____
1ST READING:	_____
2ND READING:	_____
PUBLISHED IN:	_____
DATE:	_____

AN ORDINANCE TO AMEND THE FUTURE LAND USE MAP OF THE COMPREHENSIVE LAND USE PLAN UPDATE FOR A PORTION OF PARCEL 003.19, TAX MAP 143 (A PORTION OF THE PROPERTY REFERENCED AS 133 CONCORD ROAD)

WHEREAS, the Board of Mayor and Aldermen of the Town of Farragut, Tennessee, through the Farragut Municipal Planning Commission, created and adopted the Farragut Comprehensive Land Use Plan Update and Future Land Use Map; and,

WHEREAS, the Tennessee Code Annotated, Section 13-4-201 et seq, provides that the Municipal Planning Commission shall make and adopt a general plan for the physical development of the municipality; and

WHEREAS, the Farragut Municipal Planning Commission adopted the Farragut Comprehensive Land Use Plan Update and Future Land Use Map by Resolution PC-12-18 on December 20, 2012; and

WHEREAS, the Tennessee Code Annotated, Section 13-4-202 et seq, provides that the Municipal Planning Commission and the chief legislative body may adopt parts of the Comprehensive Land Use Plan Update that correspond generally with one (1) or more of the functional subdivisions of the subject matter of the plan; and

WHEREAS, the Board of Mayor and Alderman of the Town of Farragut has adopted the Mixed-Use Town Center portion of the Future Land Use Map of the Farragut Comprehensive Land Use Plan Update; and

WHEREAS, the Board of Mayor and Alderman of the Town of Farragut may periodically amend the map of the Mixed-Use Town Center Land Use of the Farragut Comprehensive Land Use Plan Update;

NOW, THEREFORE, BE IT ORDAINED by the Board of Mayor and Aldermen of the Town of Farragut that the Future Land Use Map in the Comprehensive Land Use Plan Update is amended as follows:

SECTION 1.

Changing the property referenced as a portion of Parcel 003.19, Tax Map 143 (a portion of the property referenced as 133 Concord Road) from what is currently shown as Medium Density Residential on the Future Land Use Map to Mixed Use Town Center (see Exhibit A).

SECTION 2.

This ordinance shall take effect from and after its final passage and publication, the public welfare requiring it.

Ron Williams, Mayor

Allison Myers, Town Recorder

Certified to the Farragut Board of Mayor and Aldermen this ____ day of _____, 2020,
with approval recommended.

Rita Holladay, Chairman

Scott Russ, Secretary

FARRAGUT MUNICIPAL PLANNING COMMISSION
















Exhibit A
Ordinance 20-26

Future Land Use Map Amendment
A portion of Parcel 3.19
Tax Map 143
A Portion of the Property
133 Concord Road

From
Medium Density Residential
to
Mixed Use Town Center

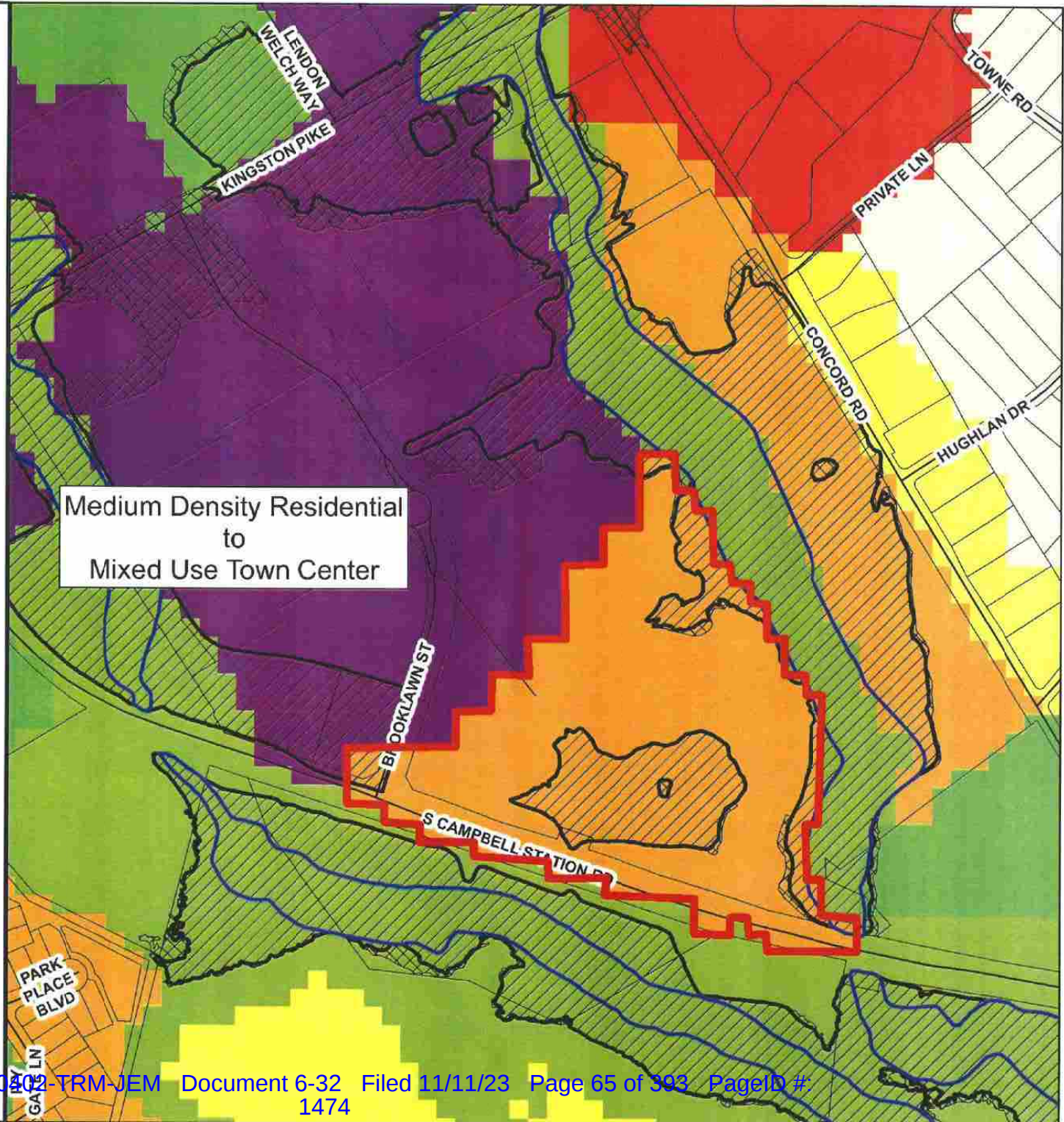
Medium Density Residential
to
Mixed Use Town Center

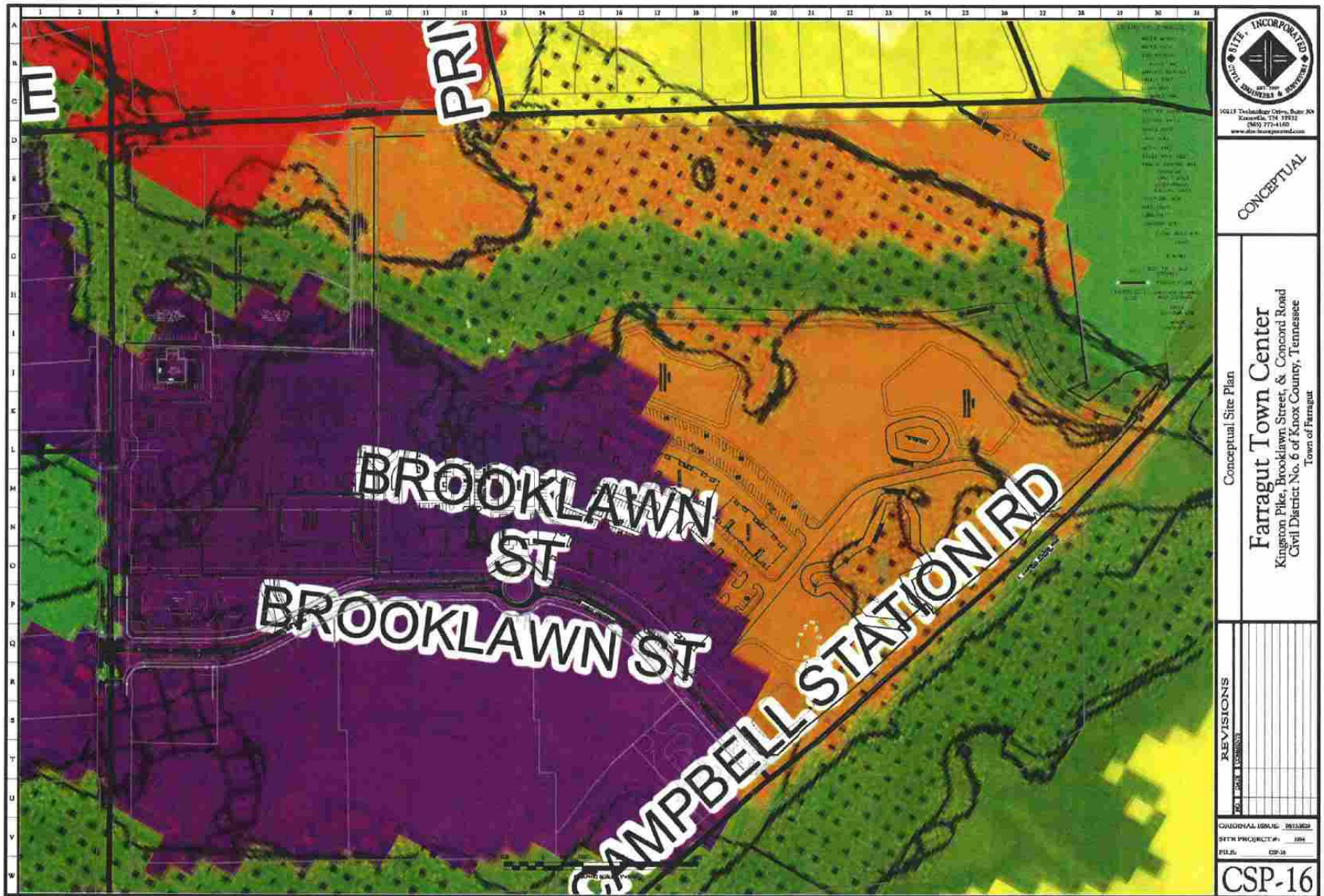
Legend

-  Subject Area
-  Floodway
-  100 year Flood Zone
-  500 year Flood Zone
-  Streets
-  Parcels
-  Commercial
-  Open Space
-  Parks and Rec
-  Very Low Density Residential (2-4 DUs / Acre)
-  Low Density Residential (3-6 DUs / Acre)
-  Med Density Residential (6-8 DUs / Acre)
-  Mixed Use Town Center (8-15 DUs / Acre)



1 in = 400 ft





REPORT TO THE FARRAGUT MUNICIPAL PLANNING COMMISSION

PREPARED BY: Mark Shipley, Community Development Director

SUBJECT: Discussion and public hearing on a request to amend the Farragut Zoning Map in association with the Farragut Town Center at Biddle Farms project, 11230 and 11240 Kingston Pike and 133 Concord Road, Parcels 3.02, 3.03, 3.10, and a portion of 3.19, Tax Map 143, from General Commercial (C-1) and General Single-Family Residential (R-2) to Planned Commercial Development (PCD), 43.63 Acres (CHM, LLC, Applicant)

INTRODUCTION AND BACKGROUND: Related to the previous agenda item, the applicant pursuing the Town Center at Biddle Farms project is requesting a zoning map amendment that would establish the Planned Commercial Development District (PCD) as the zoning district for their planned mixed-use project. Having more than one zoning district can create confusion in terms of what regulations apply and, since this is a planned commercial/residential project, the PCD is the logical choice.

As shown as part of Ordinance 20-27, a small portion of the project is currently zoned PCD. However, most of the project is zoned General Commercial (C-1) with the southeast end of the project, which does not include any proposed buildings, zoned General Single-Family Residential (R-2).

DISCUSSION: After a lengthy discussion at the staff/developer meeting on August 4, the general consensus that emerged was that the Town Center at Biddle Farms project, with its unique characteristics and surrounding plan of development, would be a good candidate for a Planned Commercial Development, especially given that a concept plan has already been presented and conditionally approved. The idea of using the PCD for this project was presented to the Planning Commission at their meeting on August 20 and was favorably received.

Since that time, the applicant has been working on putting together the information required for a rezoning request for the PCD District. Based on the information submitted, the applicant will be requesting some text amendments that will be considered at the December meeting. The project components that would involve requested text amendments were discussed in general terms with the Planning Commission at their July 16 meeting. The text amendment application was not submitted at that time because the applicant was still working through the details of their project to determine what, if any, amendments may need to be requested.

For purposes of this agenda item, staff would note that a rezoning to PCD would permit the applicant to develop under the existing language. The applicant understands that if future text amendments are not approved the project will need to be amended to comply with the established provisions.

RECOMMENDATION: Since the master concept plan that was submitted with this rezoning and that was conditionally approved by the Planning Commission in July will require text amendments, staff recommends that any approval of the rezoning will be conditioned upon the understanding that when the more detailed site and landscape plans are submitted, such plans shall be in compliance with all applicable regulations in place at that time.

Included in the packet is the applicant's revised rezoning package. This includes the Traffic Impact Study and a third-party review of the study. Staff will review the information provided and update the Commission at the meeting.

As noted in the previous item, in relation to the Eight Key Strategies identified in the Comprehensive Land Use Plan Update, changing the zoning map as provided for in Resolution PC-20-19 would help facilitate a project that would address the following:

1. Bringing About a Downtown (the project would create a main street with many components consistent with a downtown);
2. Repairing Aging Shopping Centers (the project would result in the removal of the old Kroger building and the creation of a new development with a town center street grid with building placement and streetscaping that encourage pedestrian activity, a large central gathering space for community events, a linear park, and improvements to outdated infrastructure);
3. Encouraging Greater Housing Choice (the project would provide for housing in a density, form, and location that would help support the downtown and create a more dynamic and active town center area);
4. Increasing Connectivity (the project includes numerous connections, both vehicular and pedestrian, that tie the project together internally and externally);
5. Enhancing our Identity (the project would create a unique type of development that would focus on activated spaces and pedestrian engagement along with provisions for public gatherings and community events); and
6. Planning for the Remaining Vacant Parcels (the project not only repairs an existing aging shopping center and infrastructure but it also addresses abutting areas and incorporates them into the project to help sustain the project and create an area that will be identified as downtown Farragut).

Resolution PC-20-19 recommends approval of Ordinance 20-27 which would rezone all of the property to be included in the Town Center at Biddle Farms mixed use project as PCD.

RESOLUTION PC-20-19

FARRAGUT MUNICIPAL PLANNING COMMISSION

A RESOLUTION TO APPROVE AN AMENDMENT TO THE FARRAGUT ZONING MAP, ORDINANCE 86-16, TO RECOMMEND THE APPROVAL OF THE REZONING OF THE PROPERTY AT 11230 AND 11240 KINGSTON PIKE AND 133 CONCORD ROAD, PARCELS 3.02, 3.03, 3.10, AND A PORTION OF 3.19, TAX MAP 143, FROM GENERAL COMMERCIAL (C-1) AND GENERAL SINGLE-FAMILY RESIDENTIAL (R-2) TO PLANNED COMMERCIAL DEVELOPMENT (PCD)

WHEREAS, the Tennessee Code Annotated, Section 13-4-201et seq, provides that the Municipal Planning Commission shall make and adopt a general plan for the physical development of the municipality; and

WHEREAS, the Farragut Municipal Planning Commission has adopted various elements of a zoning plan as an element of the general plan for physical development; and

WHEREAS, a public hearing was held on this request on November 19, 2020;

NOW, THEREFORE, BE IT RESOLVED that the Farragut Municipal Planning Commission hereby recommends approval of Ordinance 20-27 to the Farragut Board of Mayor and Aldermen, an ordinance amending the Farragut Zoning Ordinance and Map, Ordinance 86-16, by rezoning the above noted property.

ADOPTED this 19th day of November 2020.

Rita Holladay, Chairman

Scott Russ, Secretary

ORDINANCE:	20-27
PREPARED BY:	Shipley
REQUESTED BY:	CHM, LLC
CERTIFIED BY FMPC:	November 19, 2020
PUBLIC HEARING:	_____
PUBLISHED IN:	_____
DATE:	_____
1ST READING:	_____
2ND READING:	_____
PUBLISHED IN:	_____
DATE:	_____

AN ORDINANCE AMENDING THE ZONING ORDINANCE OF THE TOWN OF FARRAGUT, TENNESSEE, ORDINANCE 86-16, AS AMENDED, PURSUANT TO SECTION 13-4-201, TENNESSEE CODE ANNOTATED.

BE IT ORDAINED by the Board of Mayor and Aldermen of the Town of Farragut, Tennessee, that the Farragut Zoning Ordinance, Ordinance 86-16, as amended, is hereby amended as follows:

SECTION 1.

The Farragut Zoning Ordinance, Ordinance 86-16, as amended, is hereby amended by rezoning 11230 and 11240 Kingston Pike and 133 Concord Road, Parcels 3.02, 3.03, 3.10, and a portion of 3.19, Tax Map 143, from General Commercial (C-1) and General Single-Family Residential (R-2) to Planned Commercial Development (PCD) (See Exhibit A).

SECTION 2.

This ordinance shall take effect from and after its final passage and publication, the public welfare requiring it.

Ron Williams, Mayor

Allison Myers, Town Recorder

Certified to the Farragut Board of Mayor and Aldermen this ____ day of _____, 2020,
with approval recommended by the Farragut Municipal Planning Commission (FMPC).

Rita Holladay, Chairman

Scott Russ, Secretary



Exhibit A
Ordinance 20-27

Rezone
Parcel 3.02, 3.03, 3.10,
and a portion of 3.19
Tax Map 143
11230 and 11240 Kingston Pike
and 133 Concord Road

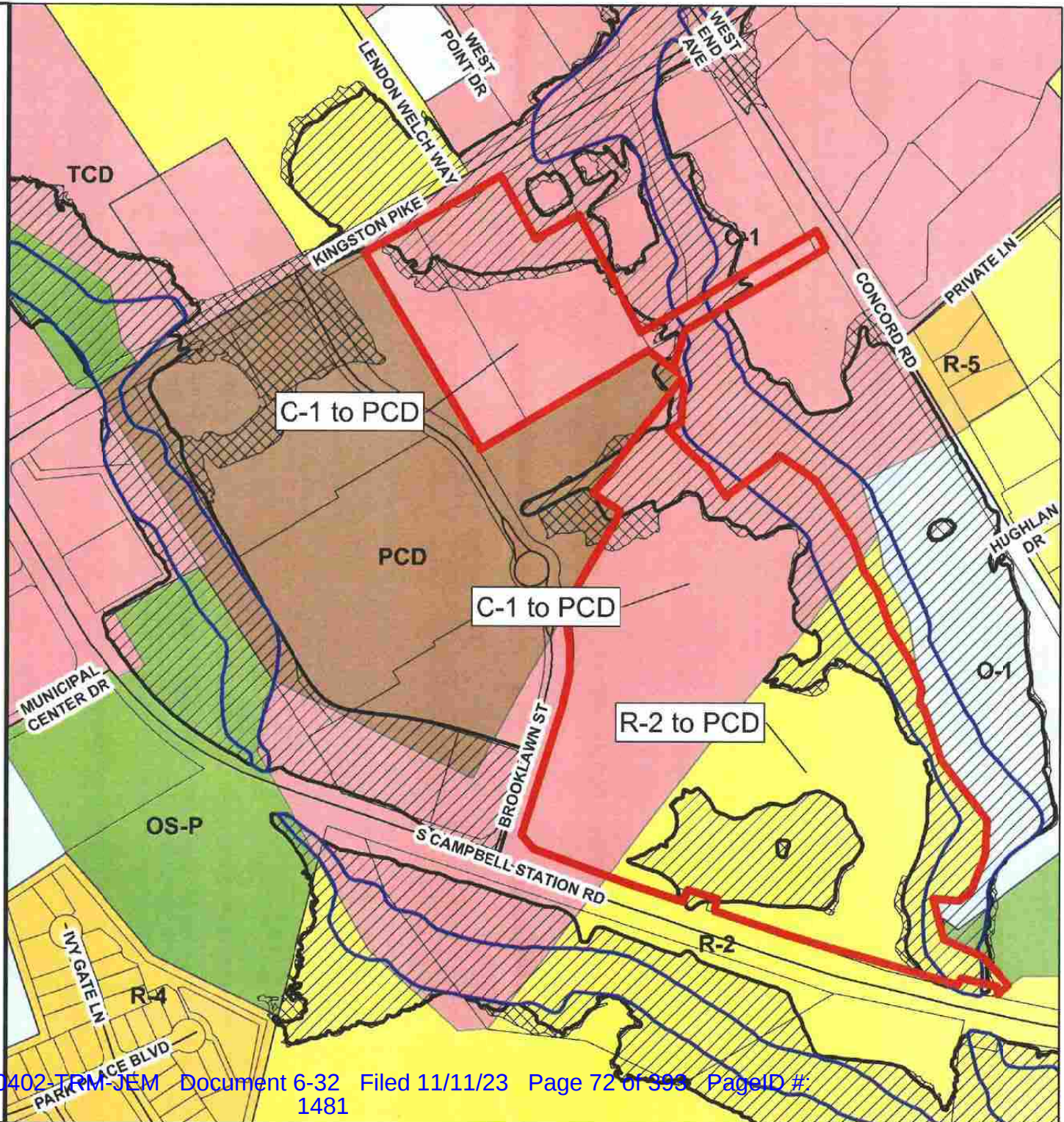
From
C-1 (General Commercial) and
R-2 (General Single-Family Residential)
to
PCD (Planned Commercial Development)

Legend

-  Subject Property
-  Floodway
-  100 year Flood Zone
-  500 year Flood Zone
-  Streets
-  Parcels
-  OS-P, Open Space/Park
-  R-2, General Single-Family Residential
-  R-4, Attached Single-Family Residential
-  R-5, Two-Family Residential
-  O-1, Office
-  Town Center District
-  C-1, General Commercial
-  PCD, Planned Commercial Development



1 in = 400 ft







November 2, 2020

Mr. Darryl W. Smith, P.E.
Town Engineer
Town of Farragut
11408 Municipal Center Drive
Farragut, Tennessee 37934

**RE: Traffic Impact Study Report Review
Farragut Town Center at Biddle Farms
Farragut, TN**

Dear Mr. Smith:

Cannon & Cannon, Inc. (CCI) appreciates the opportunity to review the traffic impact study report for the proposed Farragut Town Center at Biddle Farms development prepared by CDM Smith. It is our understanding that the proposed development will consist of a grocery store, retail shops, and multi-family residential units. We further understand that the development will be located east of the existing Kroger development. Access to Kingston Pike and Campbell Station Road will be provided via Brooklawn Street, and the development will also have access to Concord Road. The development is expected to produce between 6,000 and 7,000 new daily trips.

We have reviewed the report for this traffic impact study, and it is our opinion that the overall report content, conclusions, and recommendations were developed using sound engineering methods and assumptions. The utilization of 2016 counts due to current traffic conditions with Covid was appropriate. The annual growth rates of 2.5% for 2020 existing traffic and 3.5% for 2025 background traffic are reasonable as is the factoring of the count at Brooklawn and the driveway accesses by 10%. CDM Smith acknowledged the traffic issues at the intersections of Kingston Pike with Campbell Station Road and Kingston Pike with Concord Road, and they provided potential mitigation measures for these issues.

Regarding traffic generated by the proposed development, we have no issues with the methods utilized and the assumptions made for the trip generation estimates. We further agree that it was appropriate to provide separate trip distributions for the residential and commercial components. Based on the capacity analysis comparisons of background traffic without the development and projected traffic with the development, we agree that the two critical intersections (Kingston at Campbell Station and Kingston at Concord) may experience unstable conditions without mitigation, but that these conditions will not significantly worsen due to traffic generated by the proposed development.

Sincerely,

Brian J. Haas, P.E., PTOE
Project Manager

TEL **865.670.8555**
CANNON-CANNON.COM

KNOXVILLE 8570 Kingston Pike
Knoxville, TN 37909
FAX 865.670.8800

FARRAGUT TOWN CENTER AT BIDDLE FARMS

Town of Farragut

TRAFFIC IMPACT STUDY

***Prepared for :
CHM, LLC***

Prepared By:



October 2020



10/29/2020

October 2020

Prepared by

CDM SMITH
Alexander Place
1100 Marion Street, Suite 300
Knoxville, Tennessee 37921

Project No. 245285

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INTRODUCTION

CDM Smith is pleased to submit this report to address any traffic impact and access for the development of the Biddle Farms Property, a mixed-use retail commercial and residential development. This traffic study required the collection of traffic data, generation of anticipated traffic volumes for the proposed site and development of projected traffic volumes for normal growth and from the potential site. Analyses of the resulting traffic projections were conducted to determine the capacity and levels of service for the site access to Kingston Pike, Campbell Station Road South, and Concord Road. This study will evaluate the development's impact and determine if any mitigation measures are necessary to minimize the traffic impact including improved roadway geometrics and traffic control devices.

Project Description

The proposed development of the Biddle Farms is a mixed retail commercial and residential development on a total of approximately 29.3 acres with current zoning of C-1 and PCD, which could permit development of 295,000 square-feet of retail commercial. This study will address the site with a proposed PCD zoning and the development of a 20,442-square foot grocery with 42,000 square feet of retail shops and approximately 290 multi-family residential units. The retail commercial development will be of a town center concept which includes shops adjacent to local street facilities with on-street parking. **Figure 1** shows the proposed site plan. The proposed access is to Brooklawn Street serving the Farragut Town Center with intersections to Kingston Pike (US 11/70) and South Campbell Station Road. The site would utilize an existing access to Concord Road to the east.

Site Location

The proposed development is to be located in the Town of Farragut at the old Kroger site with access opposite Lendon Welch Way at Kingston Pike. The site is bound by Kingston Pike to the north, Brooklawn Street to the west and Concord Road to the east. The site is southeast of the Kingston Pike and Campbell Station Road intersection. **Figure 2** illustrates the site location relative to local and regional access.

**SITE
PLAN**
Biddle Farms

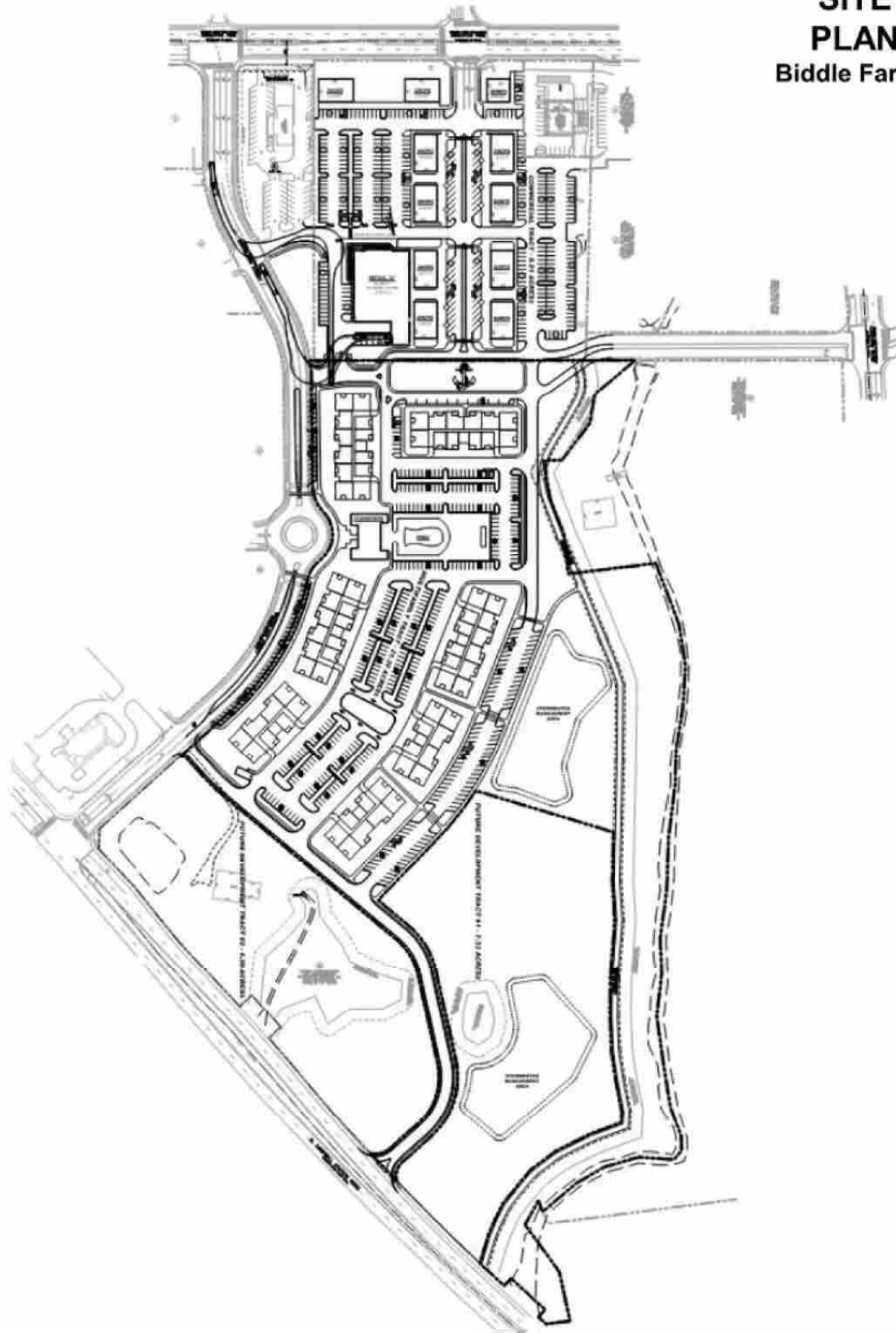
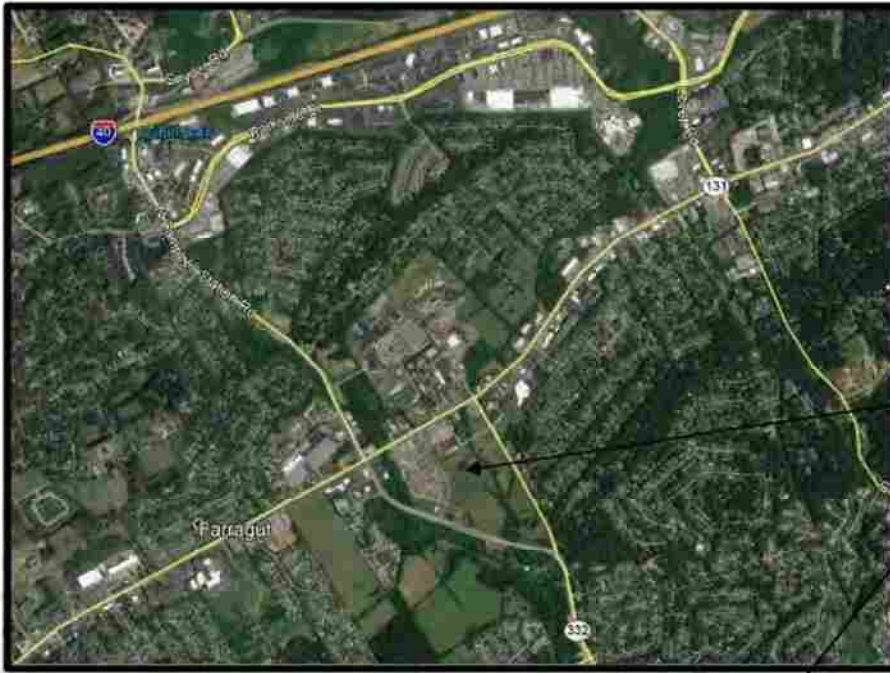


Figure 1



VICINITY MAP Biddle Farms

SITE

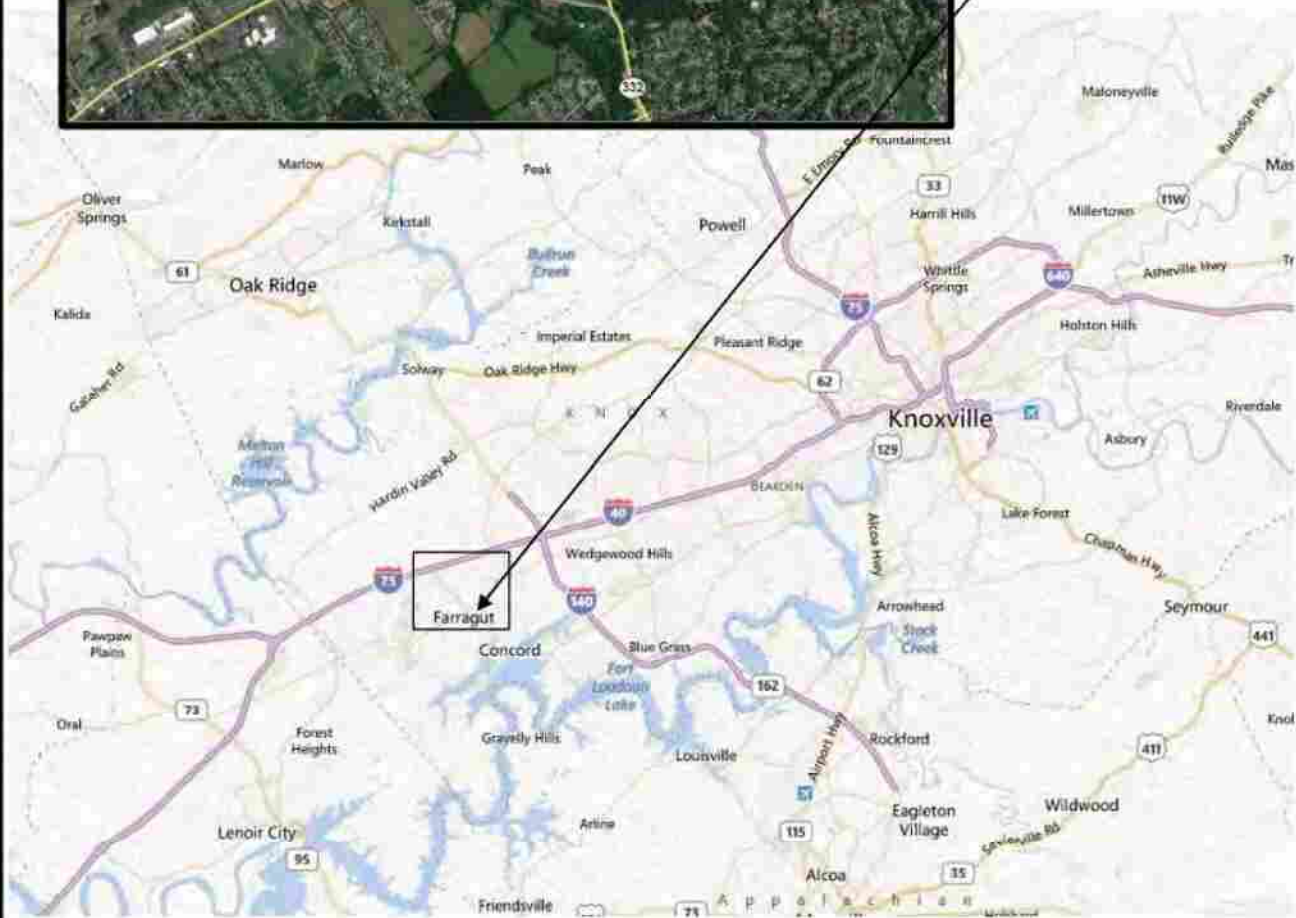


Figure 2

LOCAL AND REGIONAL ACCESS

Local Access

The proposed local access is to Brooklawn Street with intersections to Kingston Pike (US 11/70) and South Campbell Station Road. Brooklawn Street is a 2-lane section with a posted speed limit of 25mph connecting Kingston Pike and South Campbell Station Road. Kingston Pike (US 11/70) is a 5-lane east and west arterial through Farragut with the posted speed for 45 mph extending to Lenoir City to the west and Knoxville central business district (CBD) to the east. Kingston Pike has an average daily traffic (ADT) of 22,260 to the west of the site and 34,790 to the east.

Campbell Station Road South is a 5-lane arterial extending north and south of the site between Concord Road (SR 332) to the south and Hardin Valley Road to the north. Campbell Station Road has an interchange with Interstate 40/75 to the north of the site. The posted speed limit of Campbell Station Road is 45 mph and has an average daily traffic volume of 26,890 north of Kingston Pike and 11,350 south of Kingston Pike, adjacent to the site.

The existing access to Concord Road will also be utilized by the proposed development. Concord Road is a 2-lane roadway extending south from Kingston Pike to Northshore Drive. Its posted speed is 30 mph and has an approximate ADT of 10,750 adjacent to the site.

Regional Access

Regional access to this site is also from Kingston Pike accessing east and west of the site with available access south of the site. Northshore Drive is a 2-lane regional minor arterial extending east and west of the site between Papermill Road to the east and Loudon County to the west. Northshore Drive serves much residential development with some neighborhood centers to the west. To the east, Northshore Drive serves again much residential development but with more available commercial development as it extends into City of Knoxville limits.

Interstate 40/75 access is provided from Campbell Station Road to the north, Watt Road to the west, and Lovell Road (SR 131) east of site. Interstate 40 is an east and west six-lane facility running through Knoxville to the east and Nashville to the west. Interstate 75 extends north to Lexington, Kentucky, and to the west, I-75 turns south to Chattanooga, Tennessee. The Interstate 40/75 facility has a 2019 ADT of 125,370 east of Campbell Station Road and north of the site.

EXISTING TRAFFIC CONDITIONS

Existing Traffic Control

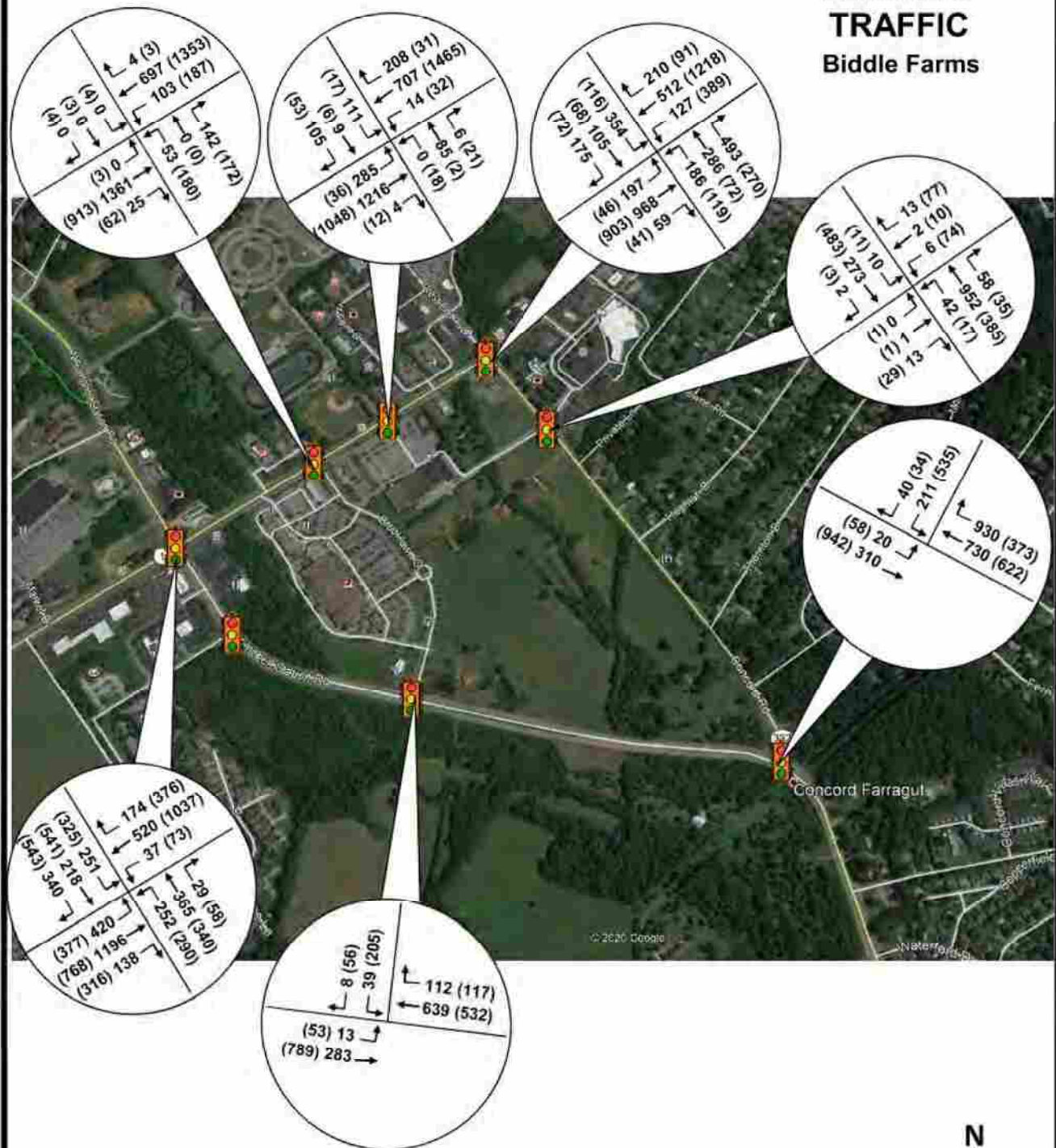
The proposed site accesses from Brooklawn Street to Kingston Pike and South Campbell Station Road are signalized. Signals are accessible to and from the site at Kingston Pike at Lendon Welch Way. Kingston Pike intersections with Campbell Station Road to the west and Concord Road to the east of the site are signalized. The South Campbell Station Road intersection with Concord Road is signalized. Brooklawn Street is a local street with a roundabout provided to serve the development and as a possible deterrent of cut-through traffic.

Existing Traffic Volumes

Current traffic counts were not conducted due to the COVID-19 pandemic which affects the 2020 traffic conditions. Traffic patterns have been affected due to many individuals working from home and schools not fully opened. Therefore, turning movement counts for the signalized intersections were provided by the Town of Farragut from a study performed in April 2016. The peak hours determined for Kingston Pike and Campbell Station Road were between 7:30-8:30AM and 5:00-6:00PM. The intersection of Kingston Pike and Campbell Station Road is the critical intersection in the vicinity of the site. With the peak hours of the development typically between 7:00-9:00AM and 4:00-6:00PM, the peak hour found using the Kingston Pike and Campbell Station Road turning movement count was appropriate for this study. The 2016 turning movements were factored up by 10-percent, reflecting a 2.5-percent annual growth rate from 2016 to 2020. This rate of growth was determined from the historical ADT traffic data available from the Tennessee Department of Transportation (TDOT). The TDOT data for count stations nearby the site show annual growth rates (between 2016 and 2018) ranging from 1.73-percent along South Campbell Station Road, 3.1-percent along Concord Road and -6.73-percent along Kingston Pike east of Concord Road. The count stations show traffic volumes trending up from 2012 and dipping in 2018 with another increase in 2019. The 2.5-percent annual growth rate provides a realistic, yet conservative, estimate for 2020 traffic volumes.

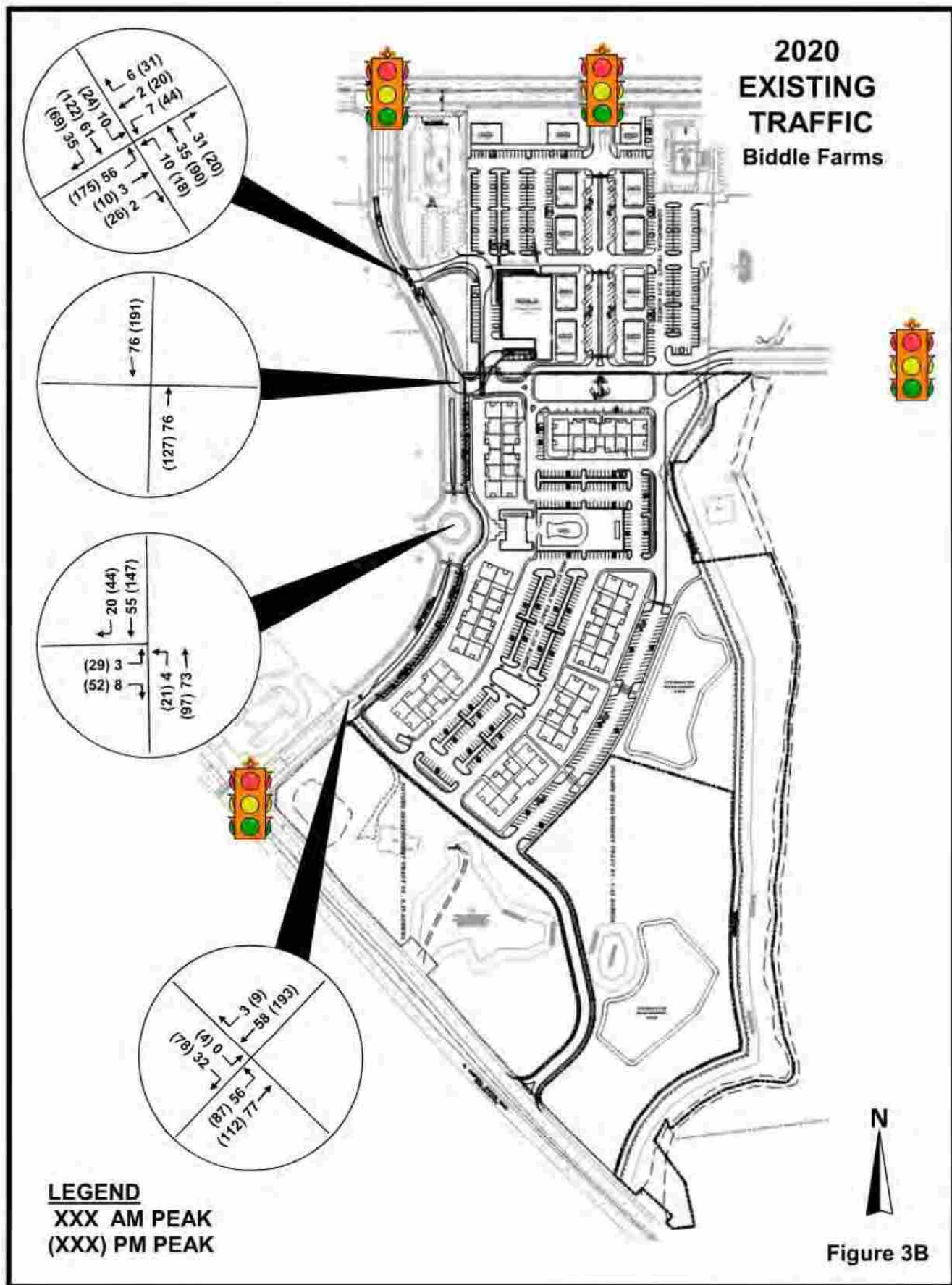
Current traffic was collected for the driveway accesses along Brooklawn Street. These turning movements were also factored 10-percent for an effect of the possible COVID-19 traffic conditions. Traffic along Brooklawn Street may not have been as affected by the pandemic conditions due to the nature of the traffic being more grocery and other essential supplies. This adjustment is to account for the possible reduction in 2020 traffic conditions related to COVID-19. **Figures 3 and 3B** illustrate the AM and PM peak-hour turning movements for 2020.

2020 EXISTING TRAFFIC Biddle Farms



LEGEND
XXX AM PEAK
(XXX) PM PEAK

N
Figure 3A



Existing Capacity and Level of Service

In order to evaluate the current operations of the traffic control devices, capacity and level of service were calculated using the **2000 Highway Capacity Manual, Special Report 209** published by the Transportation Research Board (TRB). Signalized and unsignalized intersections are evaluated based on estimated intersection delays, which are related to level of service (LOS).

Level of service and capacity are measurements of an intersection's ability to accommodate traffic volumes. Levels of service for intersections range from A to F. LOS A is the best, and LOS F is failing. For signalized intersections, LOS A has an average estimated delay of less than 10 seconds per vehicle, and LOS F has an estimated delay of greater than 80 seconds. LOS C and D are typical design values. Within urban areas, LOS D (delay between 35 and 55 seconds) is considered acceptable by the Institute of Transportation Engineers (ITE) for signalized intersections.

Unsignalized intersection levels of service have lower thresholds of delays. LOS F exceeds estimated delays of 50 seconds per vehicle. For urban arterials, minor approaches may frequently experience levels of service E. Full level of service descriptions for unsignalized and signalized intersections are presented in **Tables 1 and 2**, respectively.

Table 1
LEVEL-OF-SERVICE (LOS) DESCRIPTION
FOR SIGNALIZED INTERSECTIONS

LOS	Average Control Delay per Vehicle (seconds)	Description
A	≤ 10.0	Very low delay with extremely favorable progression. Most vehicles don't stop.
B	> 10.0 and ≤ 20.0	Generally good progression. Increase number of stops from that described for LOS "A" resulting in higher delays
C	> 20.0 and ≤ 35.0	Fair progression with increased delay. Number of stopping vehicles become significant; however, many still pass through the intersection without stopping. Stable flow.
D	> 35.0 and ≤ 55.0	The influence of congestion becomes more noticeable. Longer delays resulting from unfavorable progression, longer cycles, or high V/C ratios. Approaching unstable flow.
E	> 55.0 and ≤ 80.0	Limit of acceptable delay. Long delays associated with poor progression, long cycles, or high V/C ratios.
F	> 80.0	Unacceptable operation resulting from oversaturation (flow rates exceed capacity). Poor progression, long cycles, and high V/C ratios.

SOURCE: Highway Capacity Manual, TRB Special Report 209

Table 2
SERVICE (LOS) DESCRIPTION
FOR TWO-WAY STOP INTERSECTIONS

Level of Service	Average Control Delay per Vehicle (seconds)
A	≤ 10.0
B	> 10.0 and ≤ 15.0
C	> 15.0 and ≤ 25.0
D	> 25.0 and ≤ 35.0
E	> 35.0 and ≤ 50.0
F	> 50.0

SOURCE: Highway Capacity Manual, TRB Special Report 209

A second measure of performance that is particularly valuable under signalized operation is the volume-to-capacity ratio (V/C). This reflects the portion of capacity that is being utilized. As the V/C exceeds 0.90, the movement or intersection is less able to absorb additional traffic demand, so that relatively small increases in traffic volume can lead to significant increases in delay and possible failing conditions.

Analyses were conducted using the **Synchro** Software, developed by Trafficware. **Table 3** presents the signalized analyses of the study intersections. Intersection lane group levels of service are illustrated in **Figures 4A and 4B**.

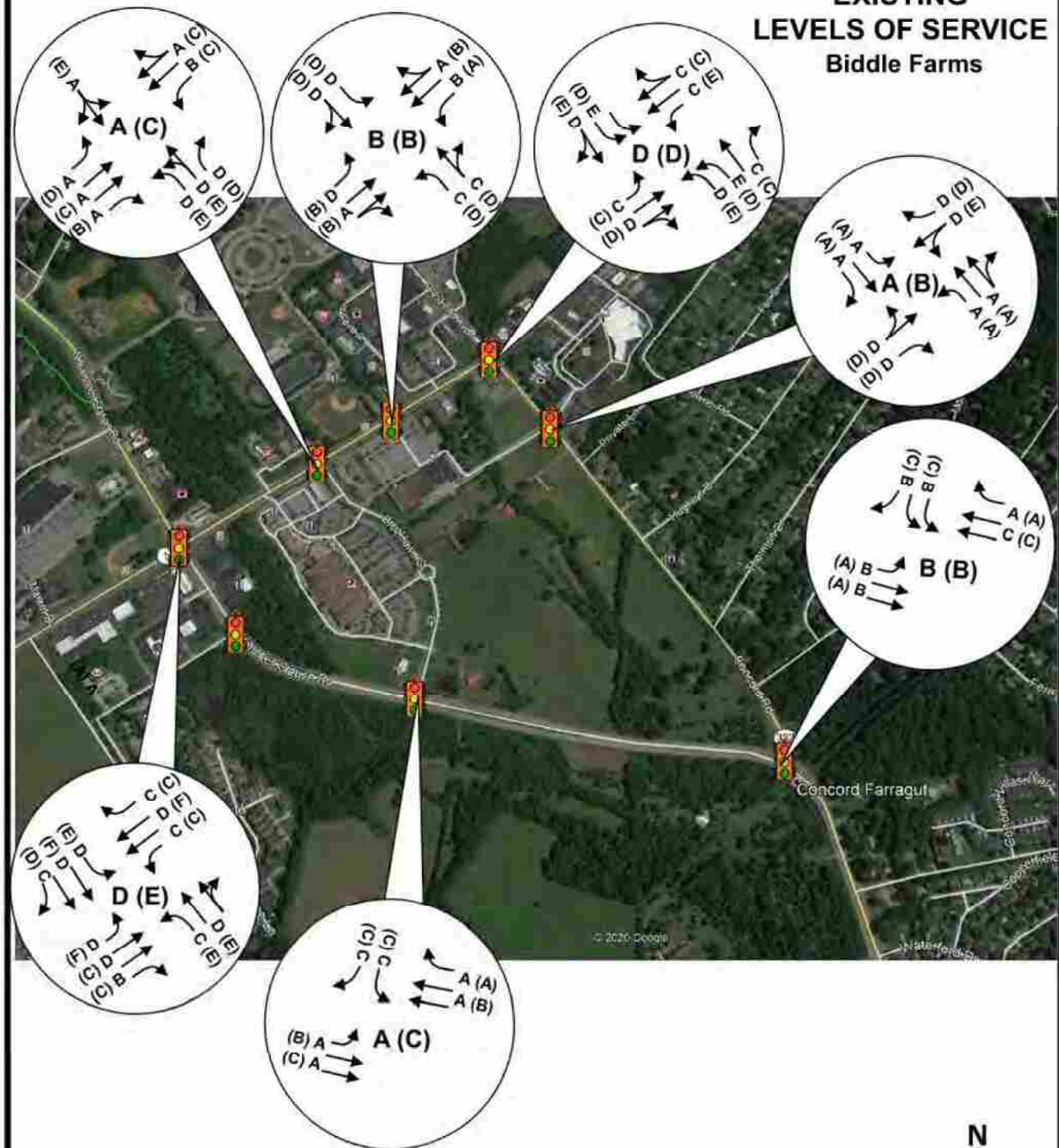
TABLE 3
2020 EXISTING
CAPACITY AND LEVEL OF SERVICE

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	w Optimized Signal Timing		
			V/C	DELAY	LOS
Kingston Pike (US 11/70) & Campbell Station Road	SIGNAL	AM	0.98	37.7	D
		PM	1.08	65.5	E
Kingston Pike (US 11/70) & Brooklawn Street	SIGNAL	AM	0.68	9.7	A
		PM	0.65	27.4	C
Kingston Pike (US 11/70) & Lendon Welch Way	SIGNAL	AM	0.84	18.0	B
		PM	0.62	15.0	B
Kingston Pike (US 11/70) & Concord Road (SR 332)	SIGNAL	AM	0.91	40.3	D
		PM	0.87	39.2	D
Campbell Station Road So. & Brooklawn Street	SIGNAL	AM	0.28	2.7	A
		PM	0.47	21.3	C
Campbell Station Road So. & Concord Road (SR 332)	SIGNAL	AM	0.62	16.2	B
		PM	0.54	17.0	B
Concord Road (SR 332) & Site Access	SIGNAL	AM	0.33	3.3	A
		PM	0.38	12.6	B
Brooklawn Street & Petco/Old Kroger Access	STOP EB/WB	AM	0.087/0.02	10.2/9.4	B/A
		PM	0.426/0.168	16.5/12.1	C/B
Brooklawn Street & Kroger Roundabout	Roundabout	AM	0.10	3.4	A
		PM	0.16	4.0	A
Brooklawn Street & Pinnacle Access	STOP EB	AM	0.04	8.7	A
		PM	0.11	10.1	B

Note: Average vehicle delay estimated in seconds.

Current conditions at all study intersections are LOS E or better. Intersections are operating with a minimum LOS C except for the Kingston Pike intersections with Campbell Station Road and Concord Road. The PM peak hour for the intersection of Kingston Pike at Campbell Station Road is a LOS E and operates over capacity with a V/C ratio of 1.08, thereby an operation that is unstable and experiencing saturated traffic flows resulting in significant congestion with adverse traffic queues. The Kingston Pike intersection with Concord Road is a LOS D during the peak hours with a capacity ratio exceeding 0.90 indicating traffic conditions becoming unstable.

**2020
EXISTING
LEVELS OF SERVICE
Biddle Farms**

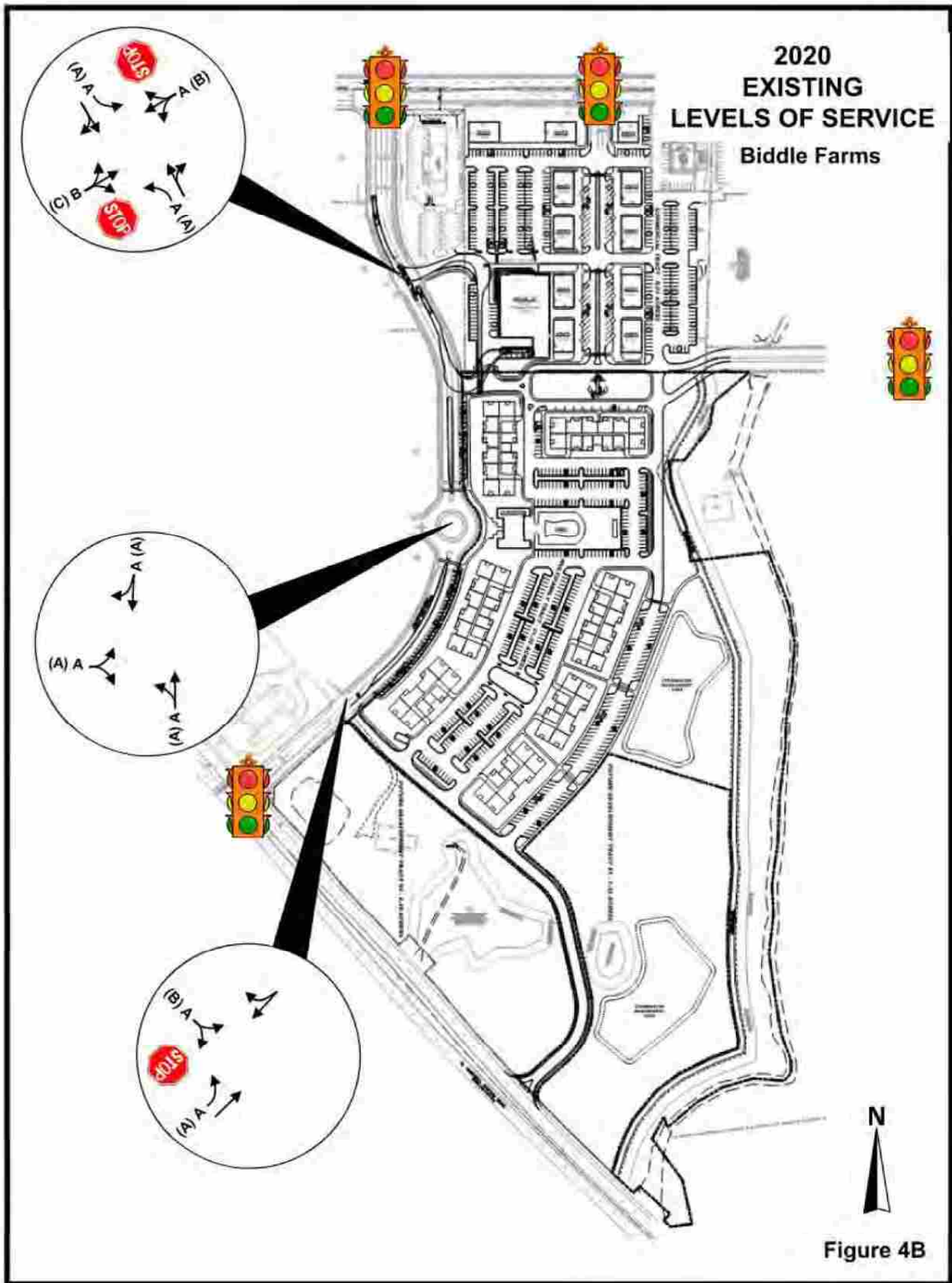


LEGEND

C AM PEAK LOS
(C) PM PEAK LOS



Figure 4A



BACKGROUND TRAFFIC CONDITIONS

Background traffic is traffic that can be anticipated regardless of the proposed development. Traffic within the study area should continue to grow due to other development. This background traffic is projected for the purpose of establishing a baseline for the evaluation of the subject site impacts.

Background Traffic Volumes

Historical traffic data is reviewed to determine traffic growth trends in the study area. Using the TDOT count stations in the vicinity of the site, annual growth rates over the past 5 and 10 years was determined. These stations and respective annual growth rates include the following:

Concord Road (Sta 455)	4.9% (5-year history)
Concord Road (Sta 139)	2.6% (5-year history)
Campbell Station Road (Sta 294)	2.7% (5-year history)
Campbell Station Road (Sta 454)	4.5% (10-year history)
Kingston Pike (Sta 363)	2.0% (10-year history)
Kingston Pike (Sta 138)	4.4% (5-year history)

This evaluation determined an annual growth rates ranged between a negligible rate and 5.0-percent. For the purpose of this study, background traffic volumes were, therefore, developed assuming an annual compounded growth rate of 3.5-percent. Background traffic is projected for the year 2025 thereby reflecting an 18.8-percent growth (compounded 3.5-percent for 5 years) applied to the through traffic volumes on Kingston Pike, Campbell Station Road, and Concord Road. Build-out of the site is assumed in the next five years. Actual build-out, however, will largely depend on the housing and retail markets.

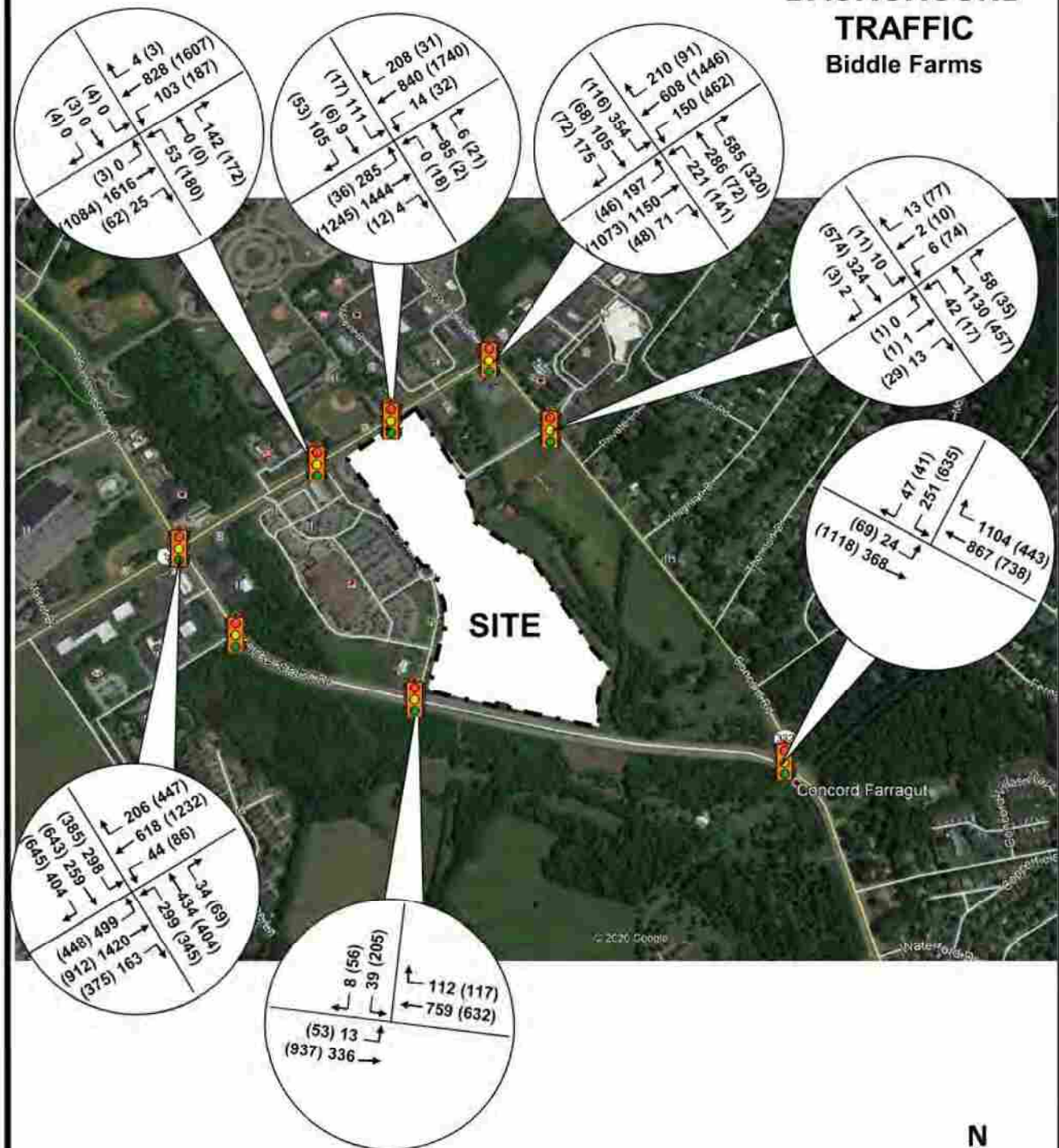
Figure 5 illustrates the grown turning movements reflecting the 2025 background traffic growth.

Background Capacity and Level of Service

Analyses were performed for the 2025 background conditions. The results of these analyses are presented in **Table 4**. The levels of service for Year 2025 are maintained from existing conditions.

The Kingston Pike intersections with Campbell Station Road and Concord Road will deteriorate to unacceptable levels of service with a PM peak hour LOS F and capacity ratio of 1.36 for Campbell Station Road and a LOS E and capacity ratio of 1.06 for Concord Road during the AM peak hour. Concord Road PM peak hour will also experience a capacity ratio exceeding 0.90 also indicating unstable traffic condition.

2025 BACKGROUND TRAFFIC Biddle Farms



LEGEND

XXX AM PEAK
(XXX) PM PEAK



Figure 5

**TABLE 4
2025 BACKGROUND
CAPACITY AND LEVEL OF SERVICE**

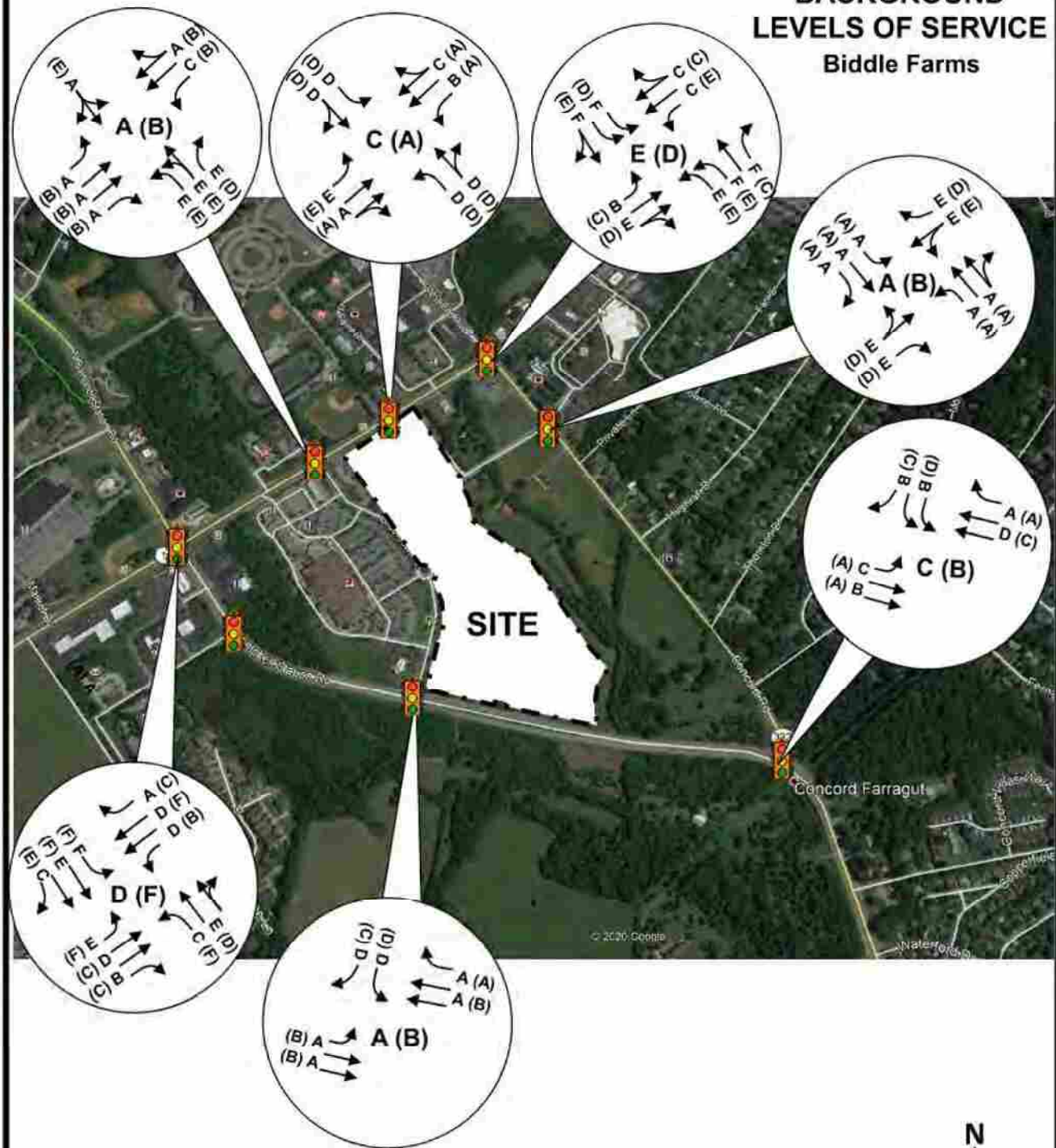
INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	w Optimized Signal Timing		
			V/C	DELAY	LOS
Kingston Pike (US 11/70) & Campbell Station Road <i>w NB, SB, and EB Double Left-turn Lanes Mitigation</i>	SIGNAL	AM	0.98	47.6	D
		PM	1.36	102.4	F
		AM	0.86	32.2	C
		PM	1.08	51.2	D
Kingston Pike (US 11/70) & Brooklawn Street	SIGNAL	AM	0.70	8.4	A
		PM	0.76	15.8	B
Kingston Pike (US 11/70) & Lendon Welch Way	SIGNAL	AM	0.80	21.5	C
		PM	0.71	6.7	A
Kingston Pike (US 11/70) & Concord Road (SR 332) <i>w NB Double Right-Turn Lanes Mitigation</i>	SIGNAL	AM	1.06	67.8	E
		PM	0.91	39.8	D
		AM	0.92	45.8	D
		PM	0.93	44.3	D
Campbell Station Road So. & Brooklawn Street	SIGNAL	AM	0.31	3.0	A
		PM	0.47	14.2	B
Campbell Station Road So. & Concord Road (SR 332)	SIGNAL	AM	0.80	22.0	C
		PM	0.63	17.7	B
Concord Road (SR 332) & Site Access	SIGNAL	AM	0.40	2.7	A
		PM	0.42	10.4	B
Brooklawn Street & Petco/Old Kroger Access	STOP EB/WB	AM	0.087/0.02	10.2/9.4	B/A
		PM	0.426/0.168	16.5/12.1	C/B
Brooklawn Street & Kroger Roundabout	Roundabout	AM	0.06	3.2	A
		PM	0.15	4.0	A
Brooklawn Street & Pinnacle Access	STOP EB	AM	0.04	8.7	A
		PM	0.11	10.1	B

Note: Average vehicle delay estimated in seconds.

With background left-turn volumes exceeding 300vph for the northbound, southbound, and eastbound approaches of the Kingston Pike and Campbell Station Road intersection, double left-turn lanes are needed for the intersection capacity and the reduction in the delay. Double left-turn movements for the Kingston Pike and Campbell Station Road intersection would be very difficult with the current development of the intersection corners. The provision of these double left-turn lanes would require several design exceptions if they were to be considered by the Town of Farragut, minimizing any right-of-way required.

For the Kingston Pike intersection with Concord Road, the LOS E and capacity can be mitigated with northbound double right-turn lanes. **Figures 6A and 6B** illustrate the background intersection lane group levels of service without and with mitigation, respectively.

2025
BACKGROUND
LEVELS OF SERVICE
Biddle Farms



LEGEND

C AM PEAK LOS
(C) PM PEAK LOS



Figure 6A

**2025
BACKGROUND
LEVELS OF SERVICE
With MITIGATION
Biddle Farms**

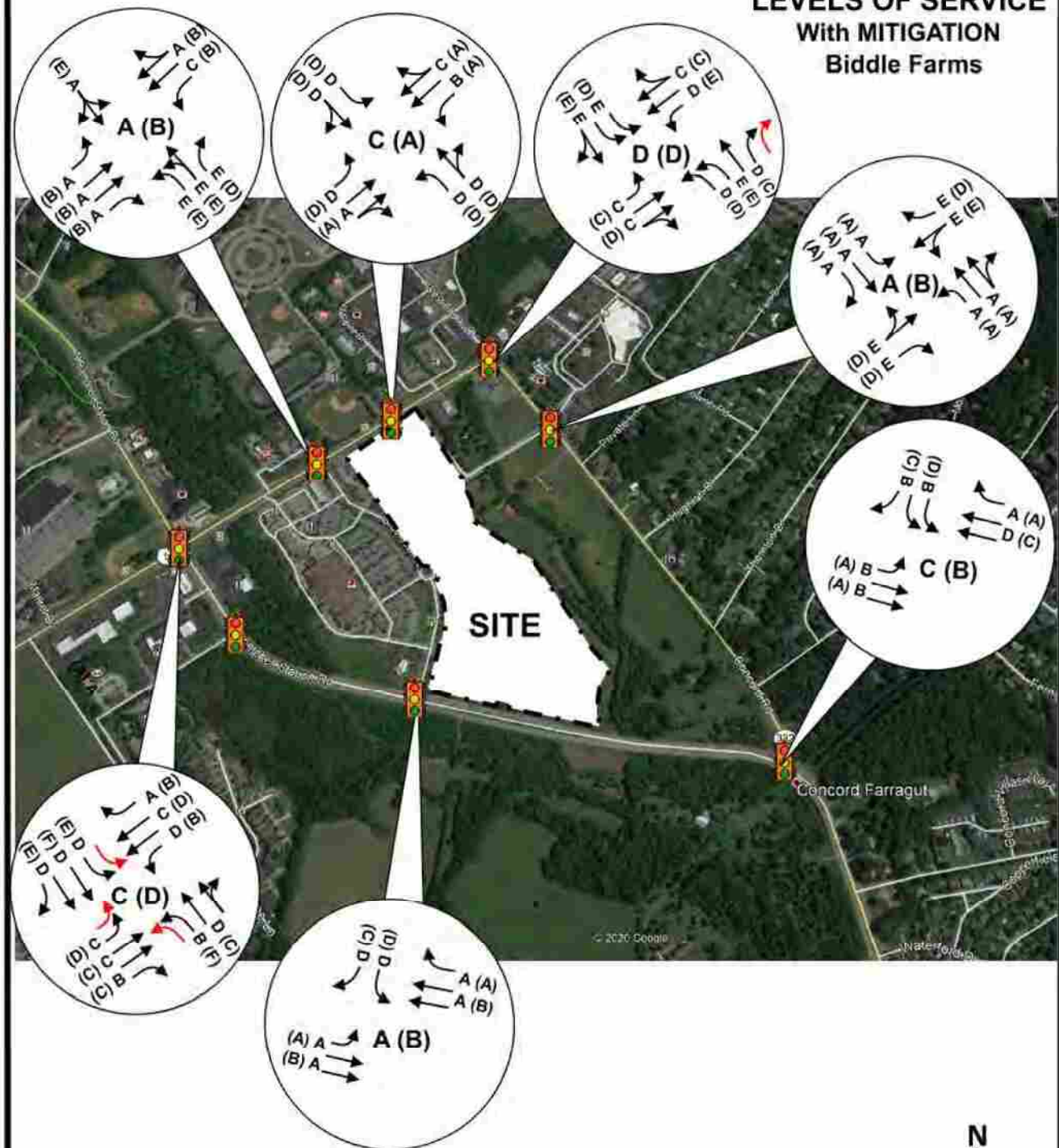


Figure 6B

PROJECT IMPACTS

Project conditions are developed by generating traffic based on the proposed land use, distributing the trips to the transportation network, and conducting analyses for capacity and level of service.

Trip Generation

Project traffic was determined using the publication, **Trip Generation, 10th Edition**. This reference is published by the Institute of Transportation Engineers (ITE) and represents national data collected for many different land uses including industrial, residential and commercial uses. **Trip Generation** is an essential tool in calculating the traffic, which may be generated by a proposed development. The study generated traffic for the approximate 29.3 acres of mixed commercial-residential development with a 20,442 square-foot Aldi's grocery with 42,000 of retail shops and approximately 290 multi-family units. The grocery land use utilized the ITE land use code (LUC 850) and the retail shops used the LUC for shopping center (LUC 820). The trip generation for the residential land use, however, utilized local trip generation rates adopted by the Knoxville-Knox County Metropolitan Planning Commission in July of 2000 for multi-family residential developments. Local trip rates were studied in accordance with the publication, **Trip Generation, 6th Edition**.

Some trip generation studies have included surveys addressing pass-by traffic. This is traffic already on the adjacent street that is attracted to the proposed development. Studies conducted for pass-by traffic have suggested that a percentage of the traffic generated by commercial retail, such as the land use at hand, may originate from the existing traffic flow; therefore, the project does not necessarily introduce all new traffic to the transportation system.

Pass-by traffic percentages differ relative to specific land uses and their densities. Some studies have shown varied results; however, the ITE publications, **Transportation and Land Development** by Virgil G. Stover and Frank J. Koepke, and **Trip Generation** have combined these studies to suggest uniform rates for given land uses. These rates range from 14-percent for hardware stores to 60-percent for neighborhood shopping centers, gross leasable area less than 100,000 square feet. Service stations and fast-food restaurants also exhibit high pass-by rates of 58-percent and 45-percent, respectively.

With the above in mind, a 20-percent pass-by and 5-percent internal trips were assumed for the proposed development. From the trip generation calculations, the proposed site may generate approximately 8,480 daily weekday trips. After the consideration of pass-by traffic and internal trips, approximately 6,730 new daily trips (Primary) may be generated for a typical weekday. Table 5 presents the trip generation of this proposed site.

TABLE 5 TRIP GENERATION

Land Use	Land-Use Code	Units	Daily Trips	AM Peak-Hour Trips		PM Peak-Hour Trips	
				Enter	Exit	Enter	Exit
Knox Co Multi-Family ⁽¹⁾	220Knox	290 units	2,485	31	111	112	92
<i>Internal Trips Reduction</i>		10%	249	3	11	11	9
Residential Primary Trips			2,237	28	100	101	83
Shopping Center ⁽²⁾	820	42,000 sqft.	3,333	107	66	137	149
Supermarket ⁽²⁾	850	20,442 sqft.	2,662	47	31	121	117
<i>Shopping Center Uses Sub-Total</i>		62,442 sqft.	5,995	154	97	258	266
<i>Pass-By Trips</i>		20%	1,199	31	19	52	53
<i>Internal/Shared Trips</i>		5%	300	8	5	13	13
Commercial Retail Primary Trips			4,496	116	73	194	200
Total Generated Trips			8,480	185	208	370	358
Total Primary Trips			6,733	143	173	294	282

References: (1) Knoxville-Knox Co. Planning trip generation rates adopted July of 2000

(2) Institute of Transportation Engineers-Trip Generation, 10th Edition

The trip generation was also conducted for the current zoning and the possible development of 295,000 square feet of retail commercial. This trip generation used a shopping center land use (LUC 820). The trip generation of the currently proposed development and the possible development with the current zoning is compared in Table 6. The comparison of the trip generation found the proposed site would produce fewer trips than the possible development with the current zoning. With the same pass-by rate of 20-percent applied to the current zoning trip generation, the primary daily trips generated were 10,037 and the PM peak hour trips were 968. This results in up to 3,300 fewer daily trips and 390 fewer PM peak hour trips with the proposed mixed commercial and residential development. An additional approximate 75 trips might be generated during the AM peak hour with the mixed-use commercial and residential site as compared to the current zoning.

**TABLE 6 TRIP GENERATION
COMPARISON WITH CURRENT ZONING**

Land Use	Land-Use Code	Units	Daily Trips	AM Peak-Hour Trips		PM Peak-Hour Trips	
				Enter	Exit	Enter	Exit
<u>CURRENT ZONING</u>							
Shopping Center ⁽¹⁾	820	295,000 sqft.	12,546	186	114	581	629
	<i>Pass-By Trips</i>	<i>20%</i>	<i>2,509</i>	<i>37</i>	<i>23</i>	<i>116</i>	<i>126</i>
	<i>Commercial Retail Primary Trips</i>		<i>10,037</i>	<i>149</i>	<i>91</i>	<i>465</i>	<i>503</i>
<u>PROPOSED DEVELOPMENT</u>							
Mixed Multi-Family & Commercial	Total Generated Trips		8,480	185	208	370	358
	<i>Pass-By Trips</i>		1,199	31	19	52	53
	<i>Internal/Shared Trips</i>		548	11	16	24	23
	<i>Total Primary Trips</i>		<i>6,733</i>	<i>143</i>	<i>173</i>	<i>294</i>	<i>282</i>
Change in Trips Generated			-4,066	-1	94	-211	-271
Change in Primary Trips Generated			-3,304	-5	81	-171	-221

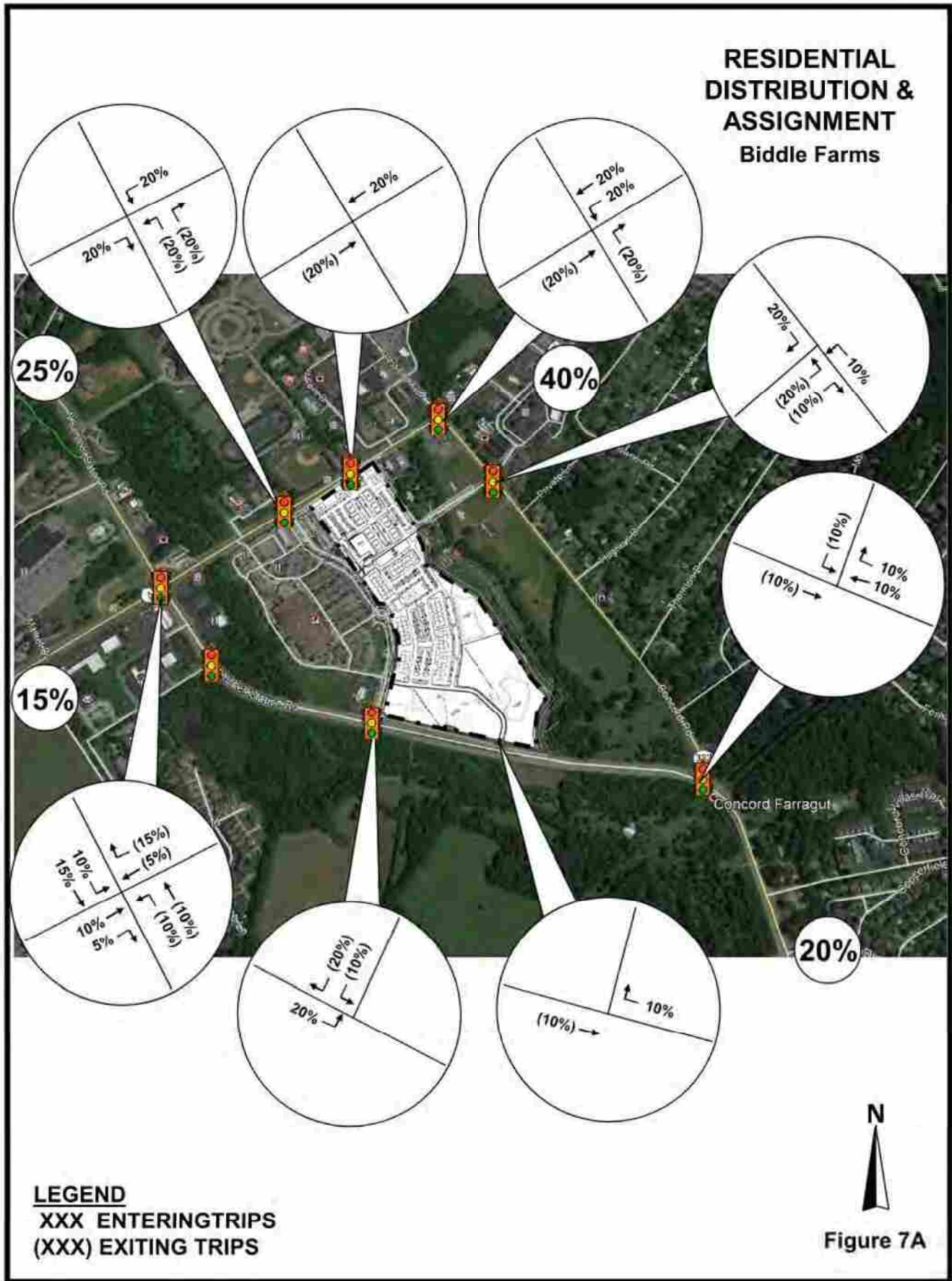
References: (1) Institute of Transportation Engineers-Trip Generation, 10th Edition

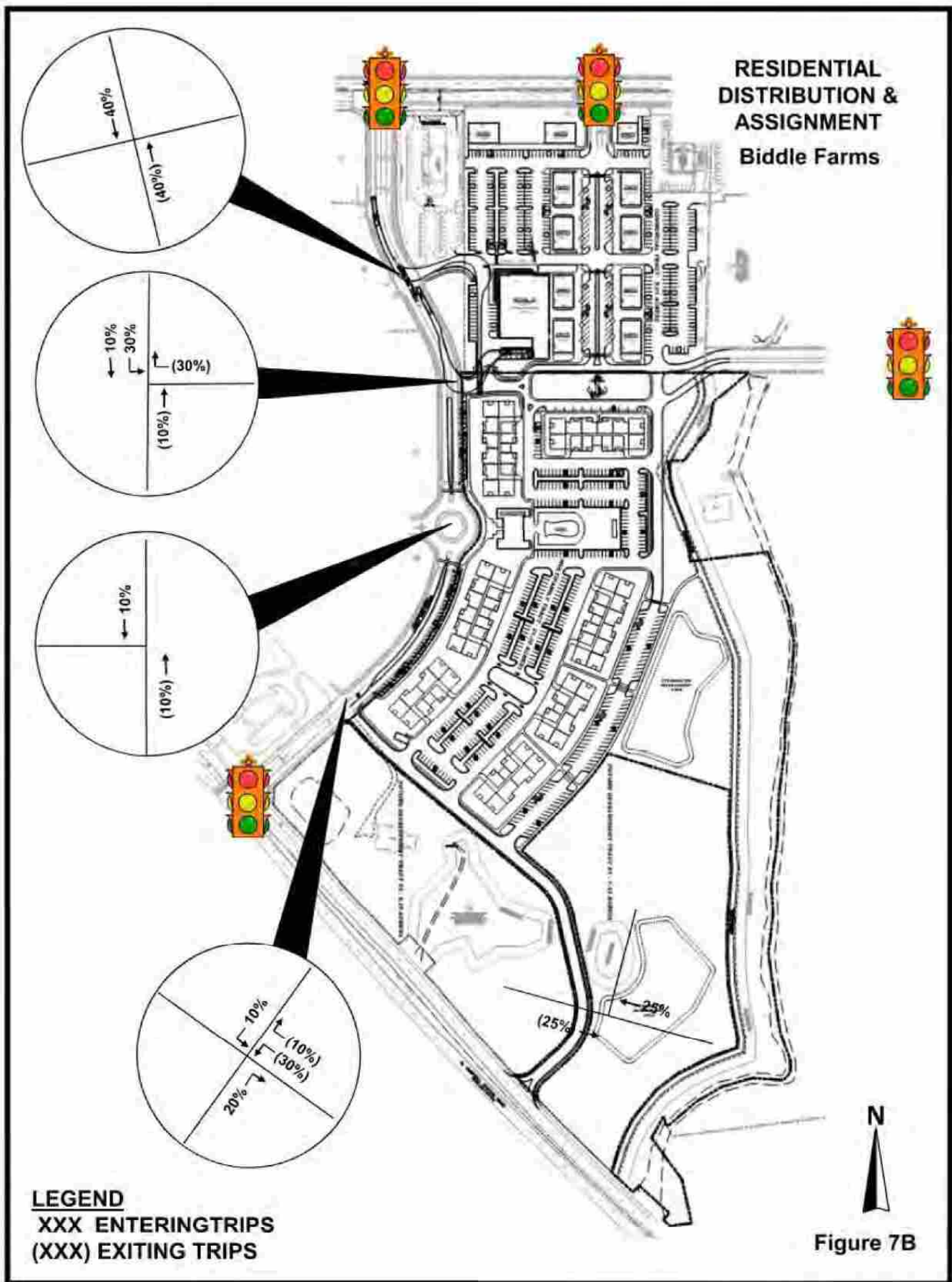
Trip Distribution and Assignment

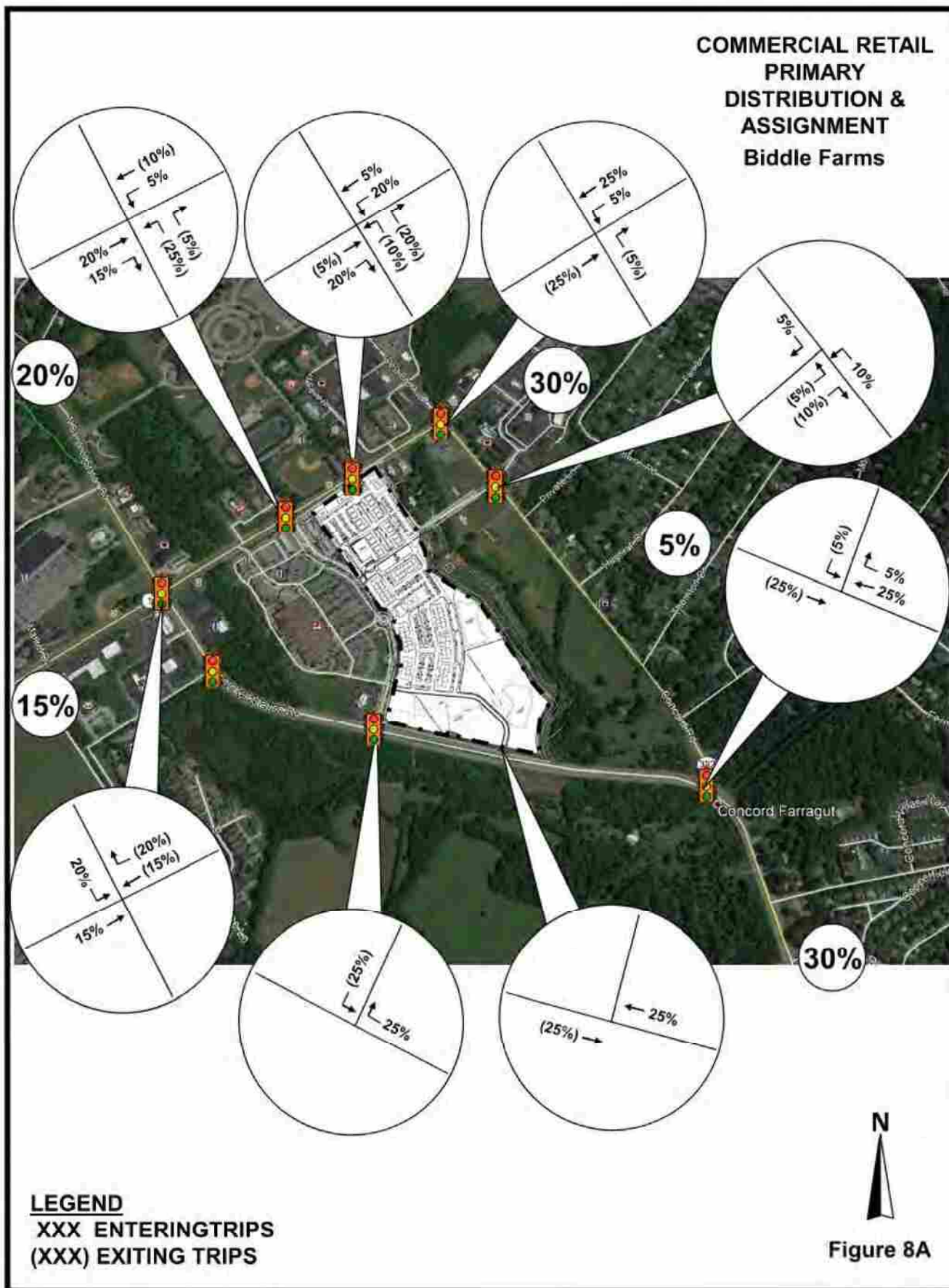
The proposed Biddle Farms should have both a localized and some regional area of influence. The retail commercial development should have a more neighborhood area of influence, a radius of approximately five miles; whereas, the residential could have some regional influence as it should exhibit commuter traffic patterns. The commercial trip distribution and assignment considered the current distribution of the current Kroger center and traffic entering and exiting Brooklawn Street. The residential distribution assumed a similar pattern exhibited by morning peak hour commuter traffic. The primary distribution, therefore assumes the following:

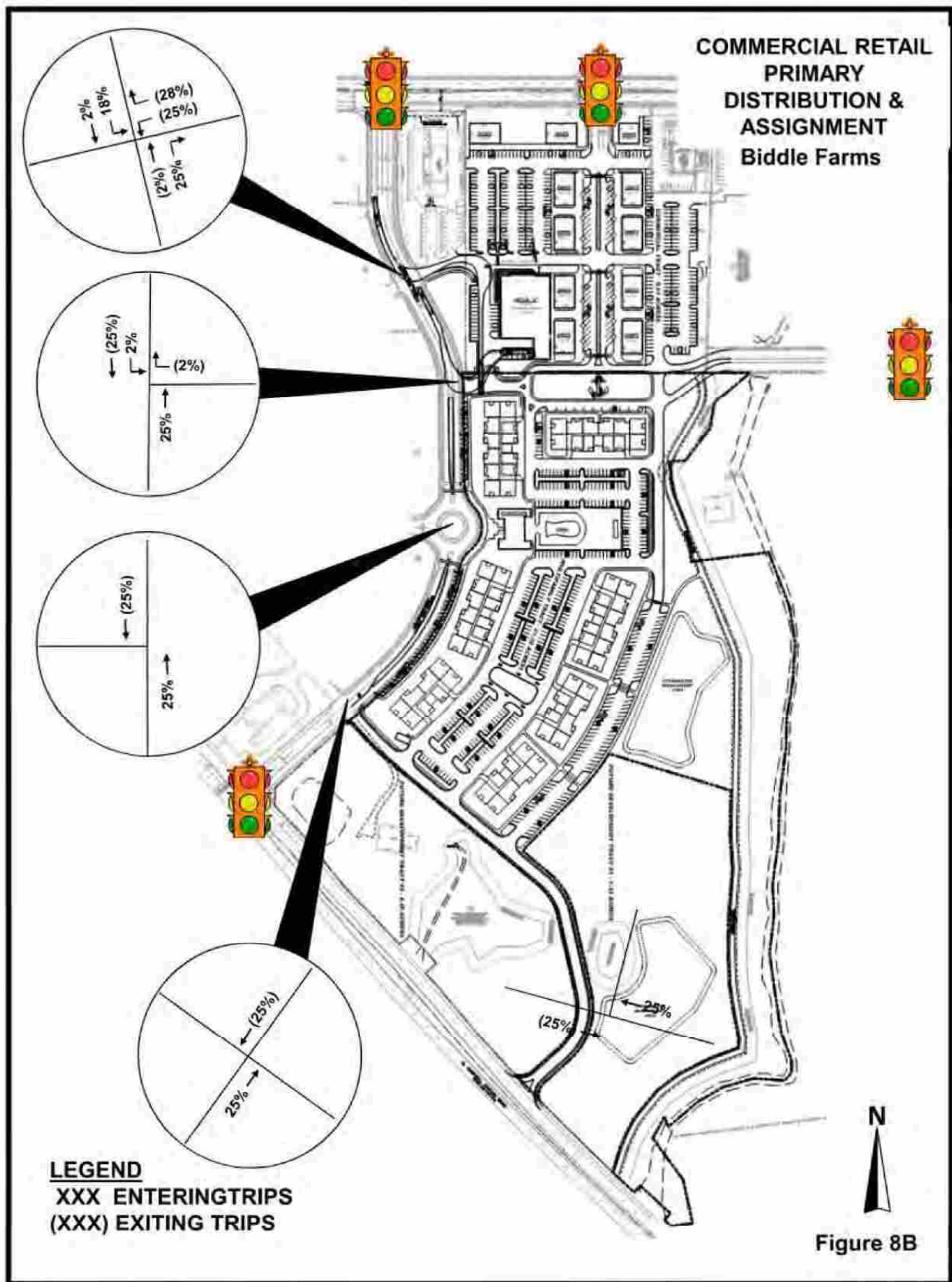
	<u>Commercial</u>	<u>Residential</u>
Kingston Pike (US 11/70) West	15%	15%
Kingston Pike (US 11/70) East	30%	40%
So. Campbell Station Road/Concord Road (SR 332) South	30%	20%
No. Campbell Station Road North	20%	25%
Concord Road (SR 332) within the Site Vicinity	5%	

Figures 7A and 7B illustrate the primary trip assignment for the primary residential trips, and **Figures 8A and 8B** illustrate the primary trip assignment for the commercial development.









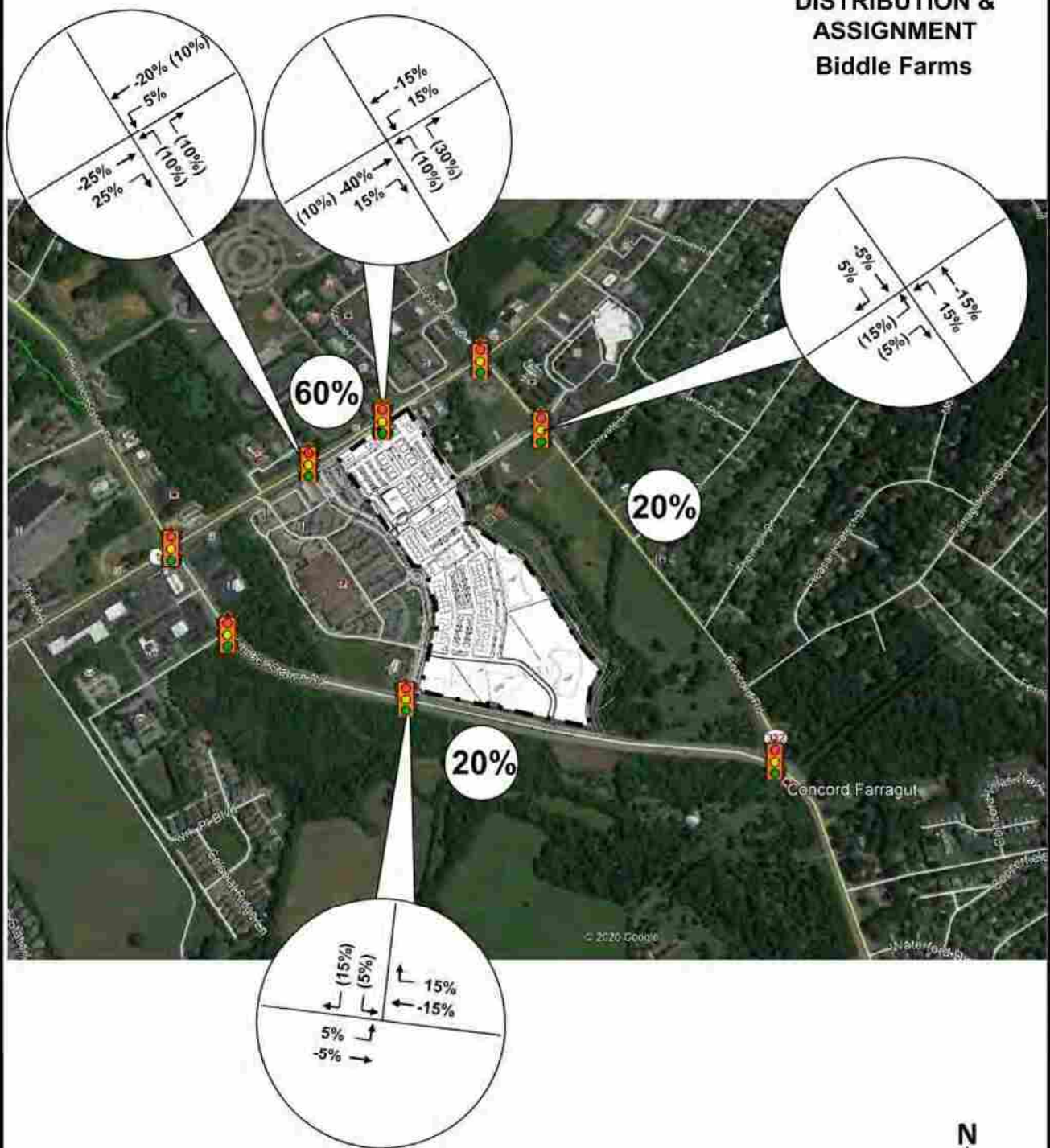
The pass-by trips for the retail commercial uses were assumed 60-percent from Kingston Pike and 20-percent from either Campbell Station Road and Concord Road. **Figures 9A and 9B** illustrate the pass-by assignments for the AM peak hour, and **Figures 10A and 10B** illustrate the PM peak hour assignment.

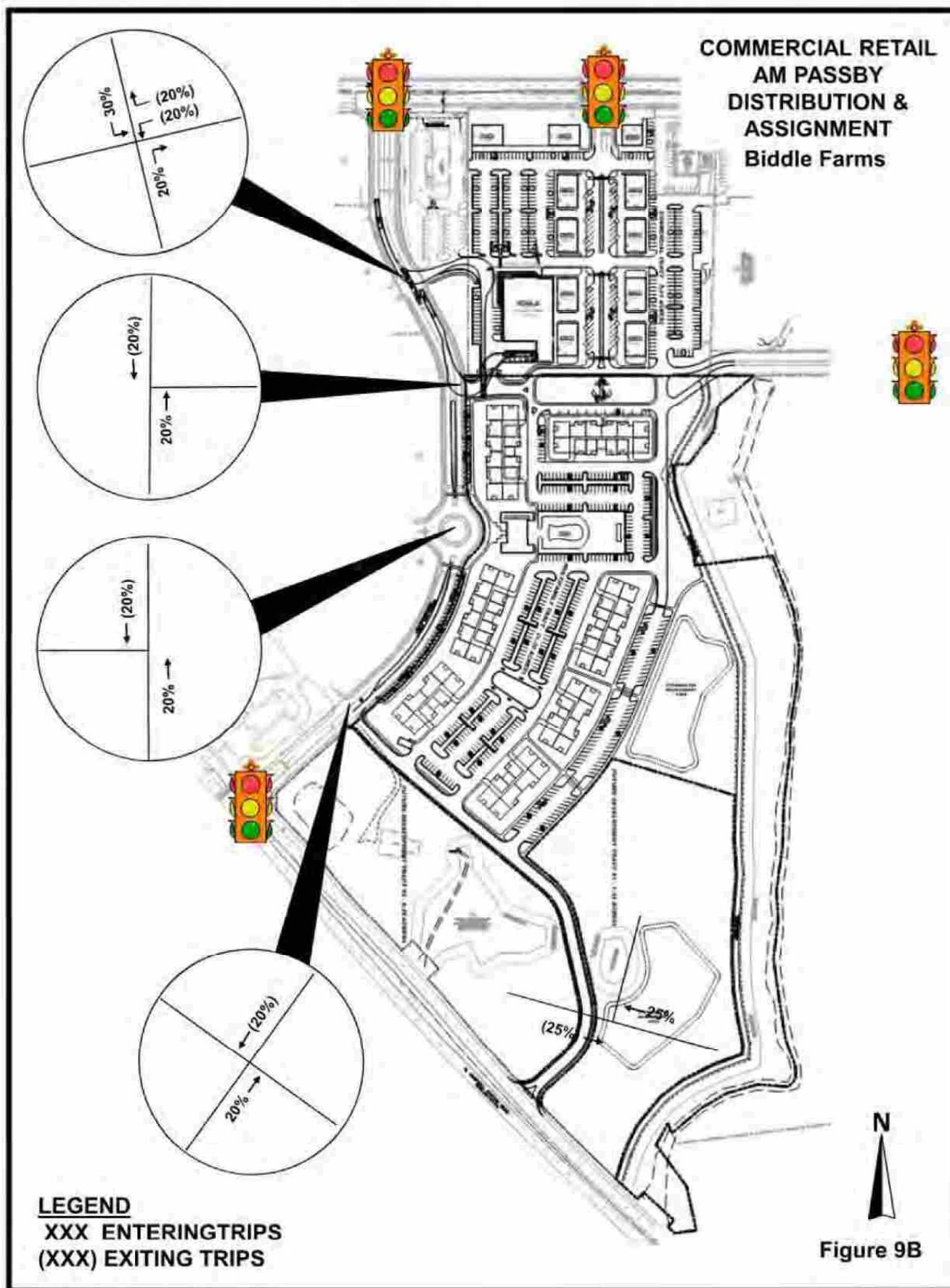
Project Traffic Volumes

By multiplying the trips generated by the trip assignments, the primary and pass-by trips were developed for the study intersections; **Figures 11A and 11B** illustrate the resulting peak hour primary trips, and **Figures 12A and 12B** illustrated the Pass-by trips associated with the proposed site. The total site trips (Primary+Pass-by) are illustrated in **Figures 13A and 13B**.

The impact of the site related traffic to the critical intersection of Kingston Pike and Campbell Station Road is limited and not considered significant as it's not more than 3.5-percent. The site trips did not account for more than 8.8-percent for than any of the study intersections with the greater impact of site trips determined for the site access to and from Concord Road.

**COMMERCIAL RETAIL
AM PASS-BY
DISTRIBUTION &
ASSIGNMENT
Biddle Farms**





**COMMERCIAL RETAIL
PM PASS-BY
DISTRIBUTION &
ASSIGNMENT
Biddle Farms**

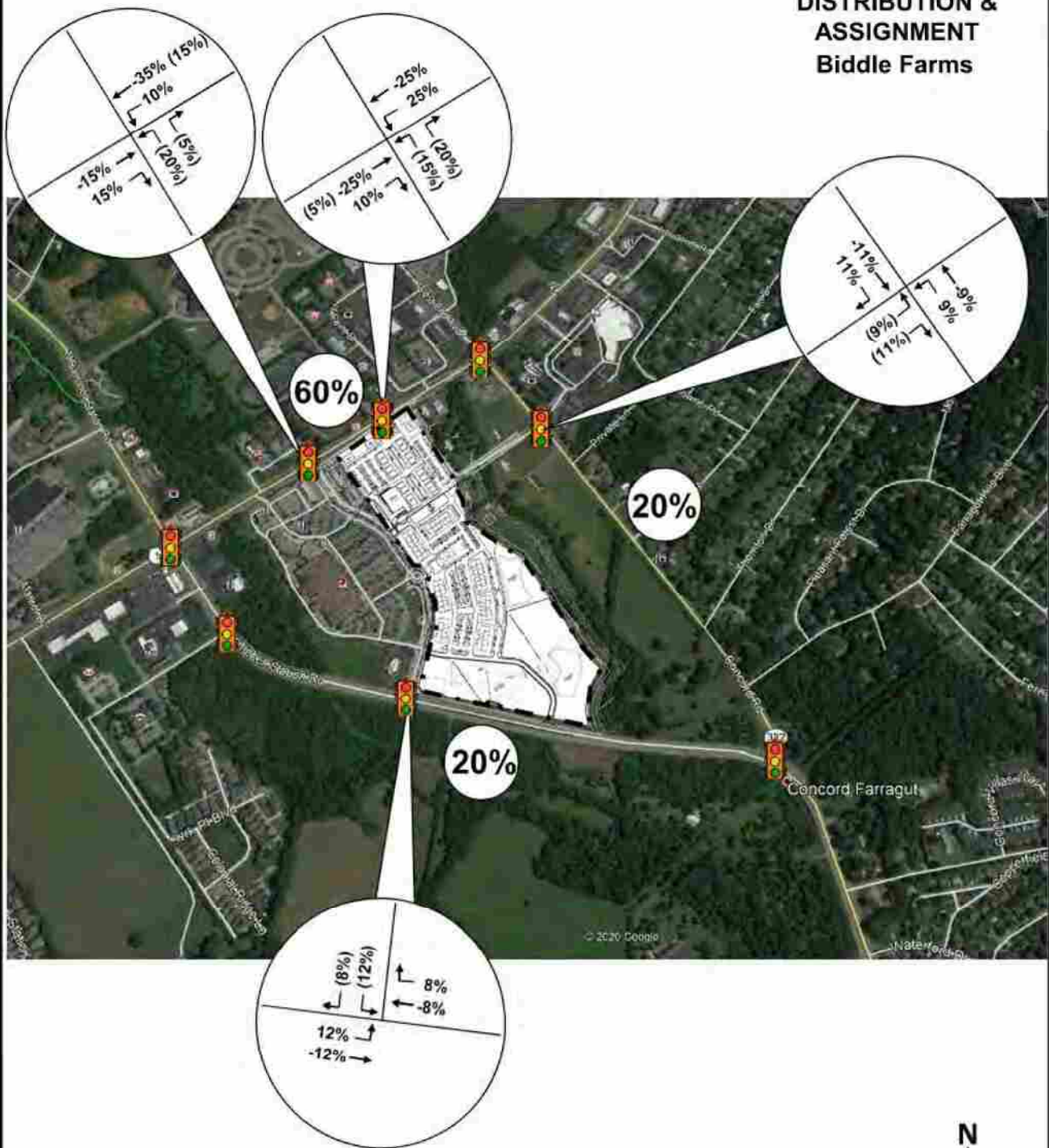
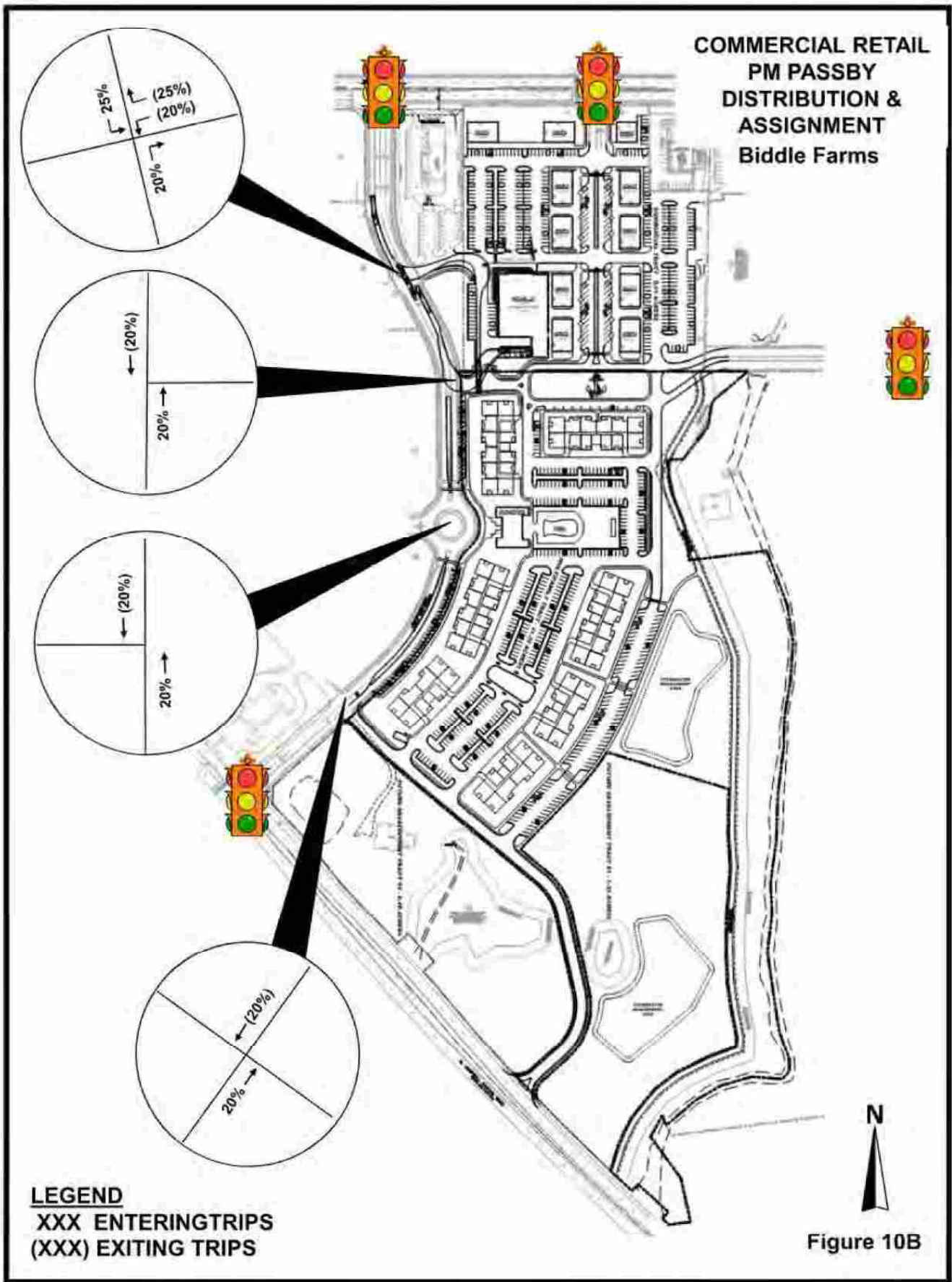
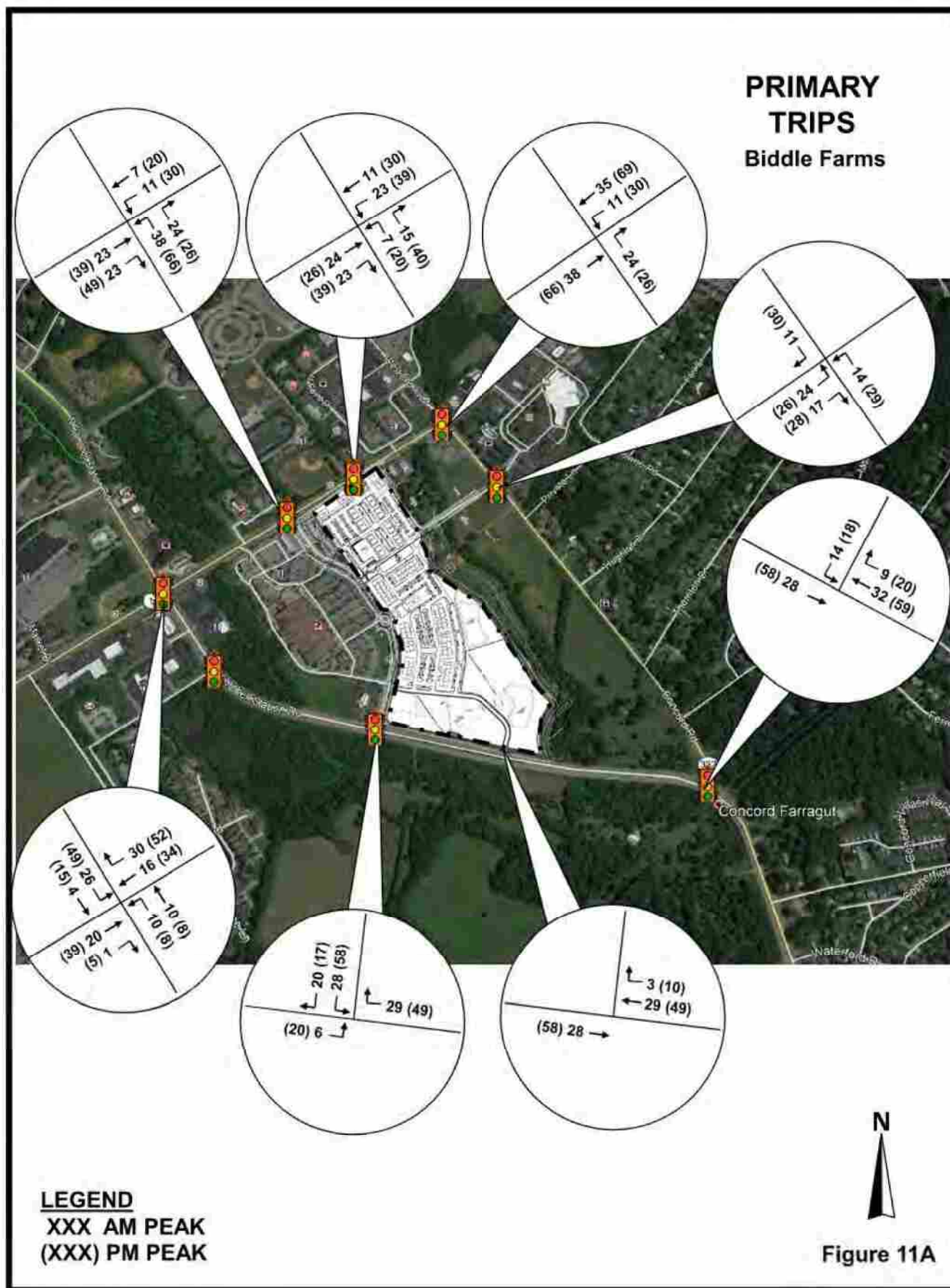
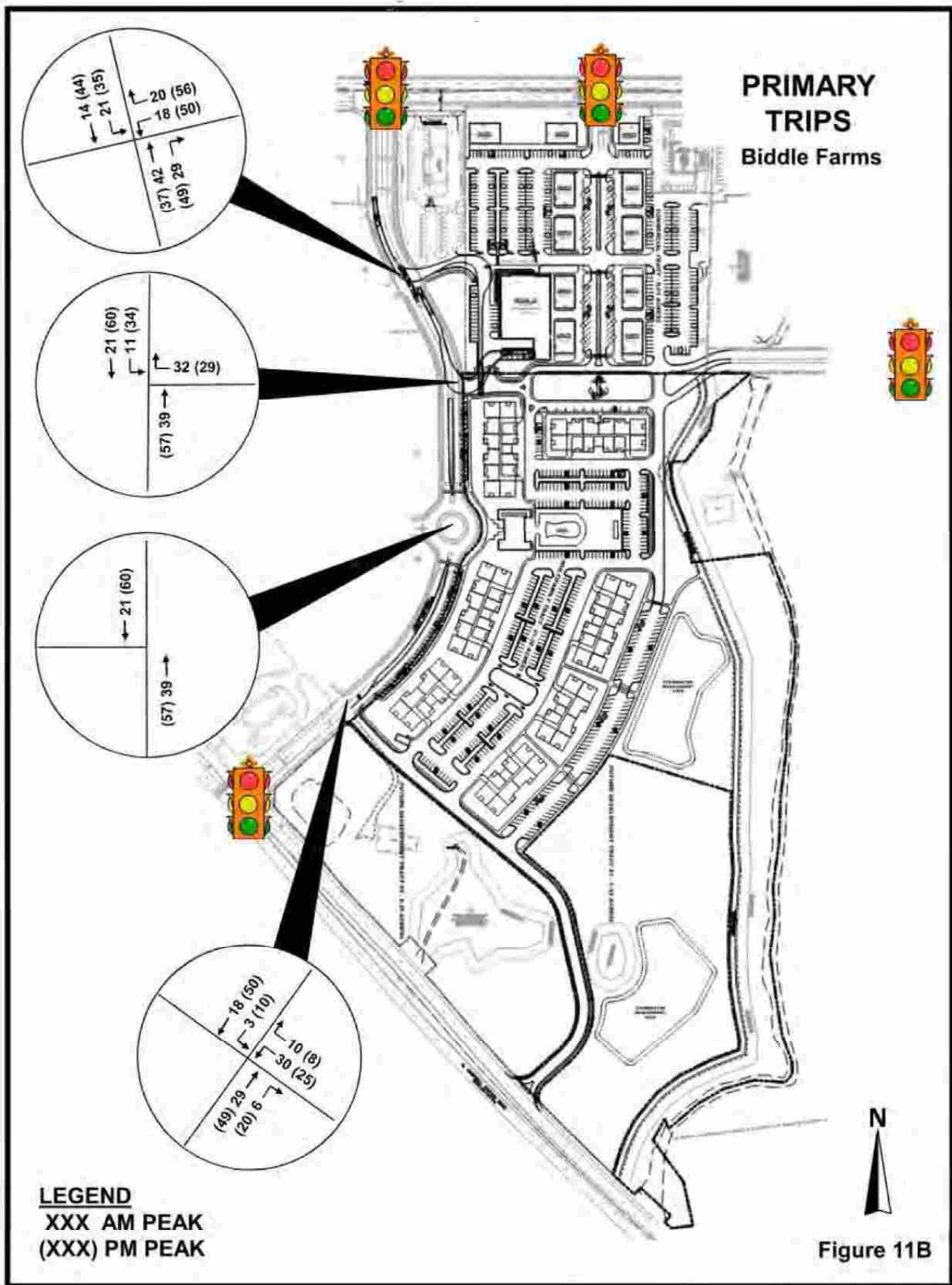


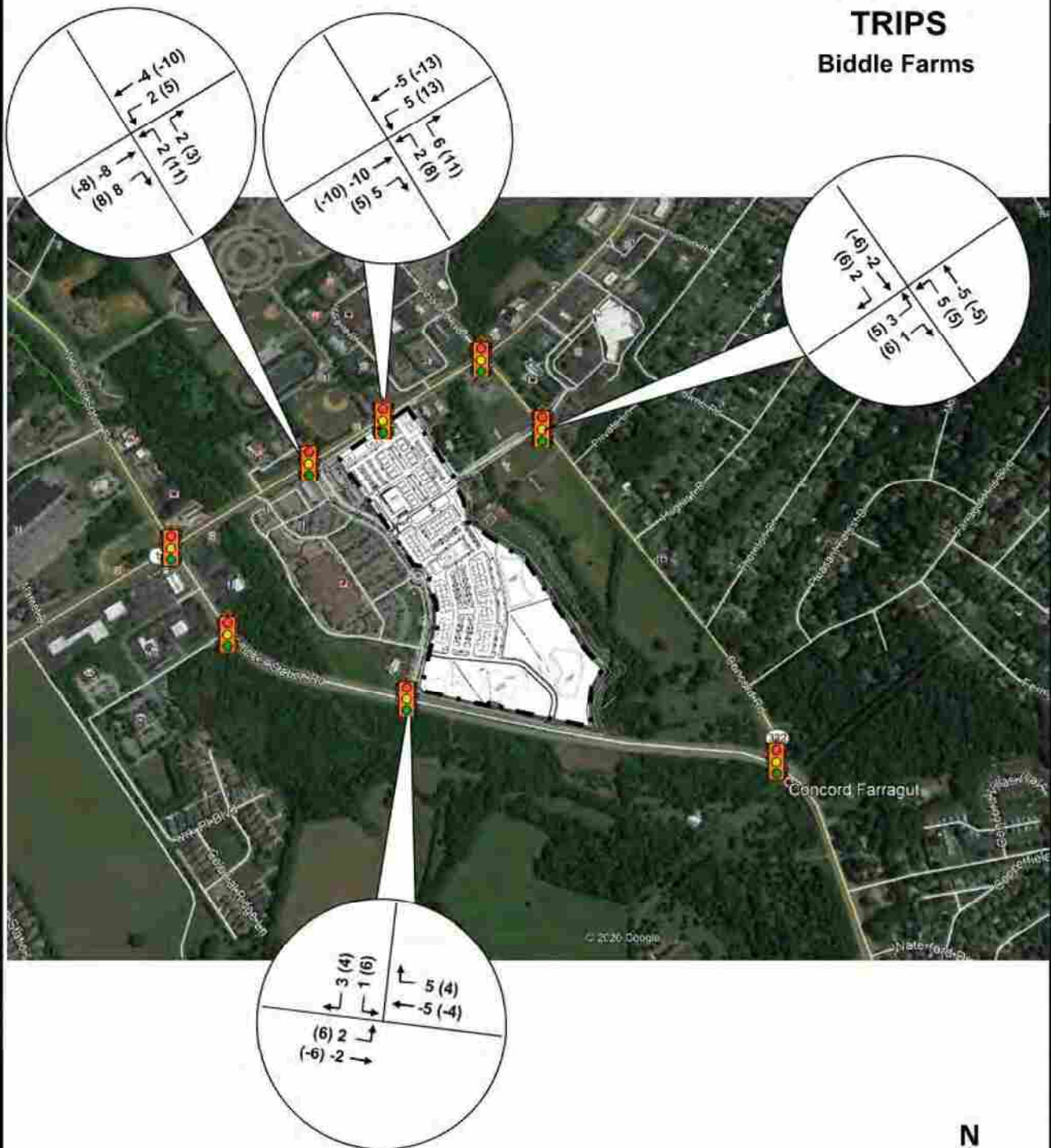
Figure 10A







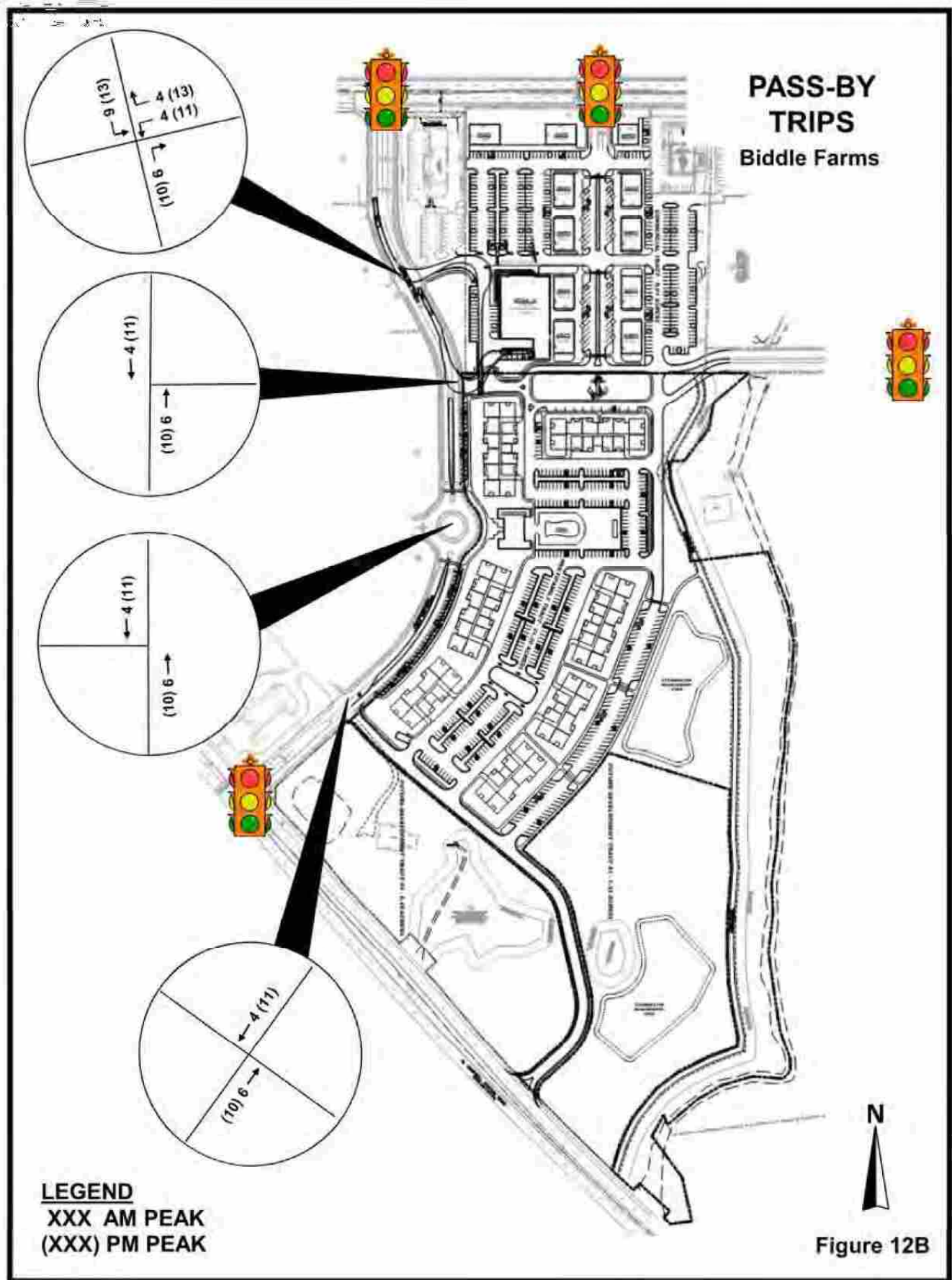
PASS-BY TRIPS Biddle Farms

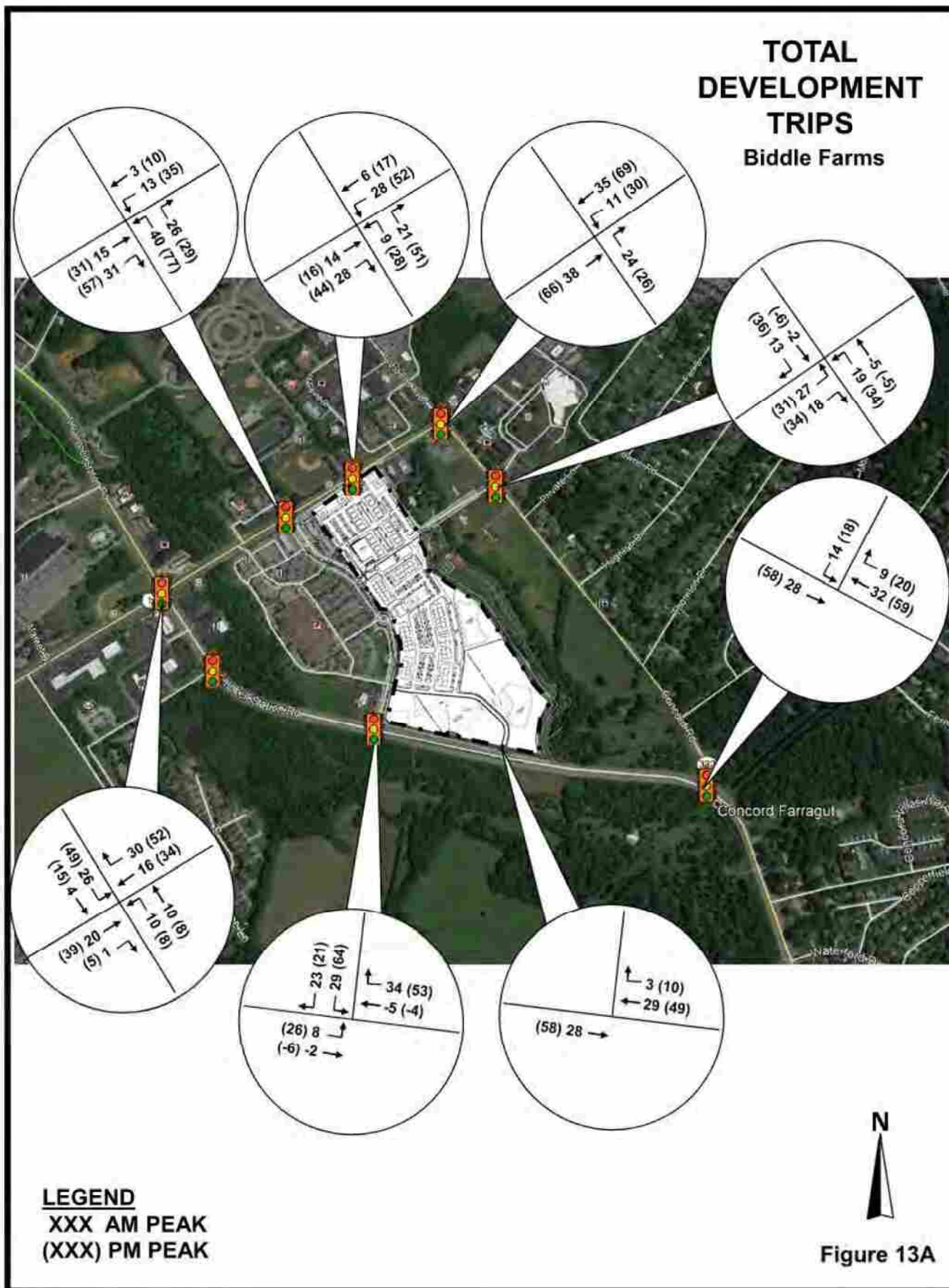


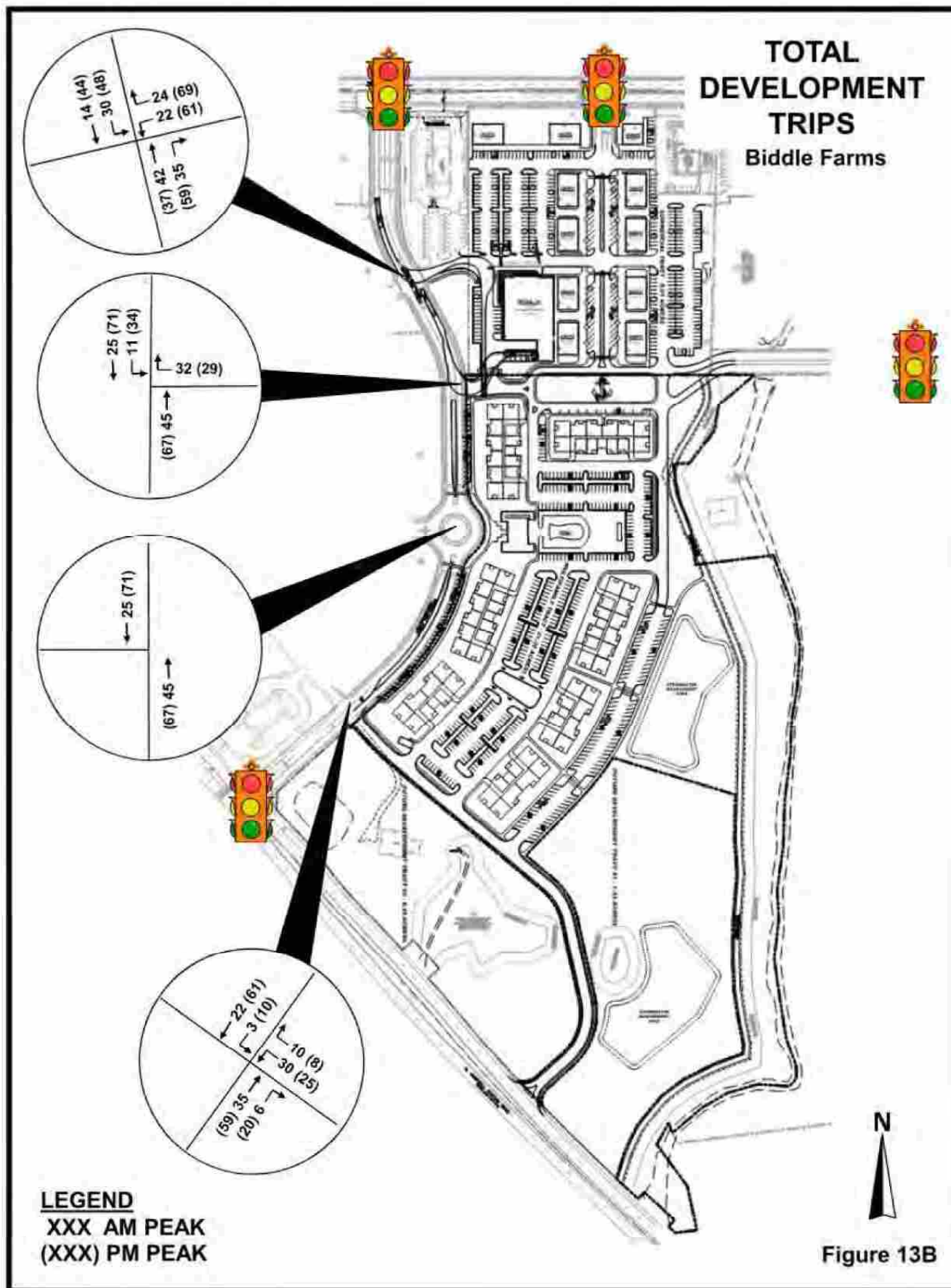
LEGEND
XXX AM PEAK
(XXX) PM PEAK



Figure 12A







Total Projected Traffic Volumes

Background and site traffic volumes were added together to develop post-development traffic volumes for the year 2025. **Figures 14A and 14B** illustrate the 2025 traffic projections, which were analyzed to assess any mitigation measures identified including traffic control devices and roadway and intersection geometry.

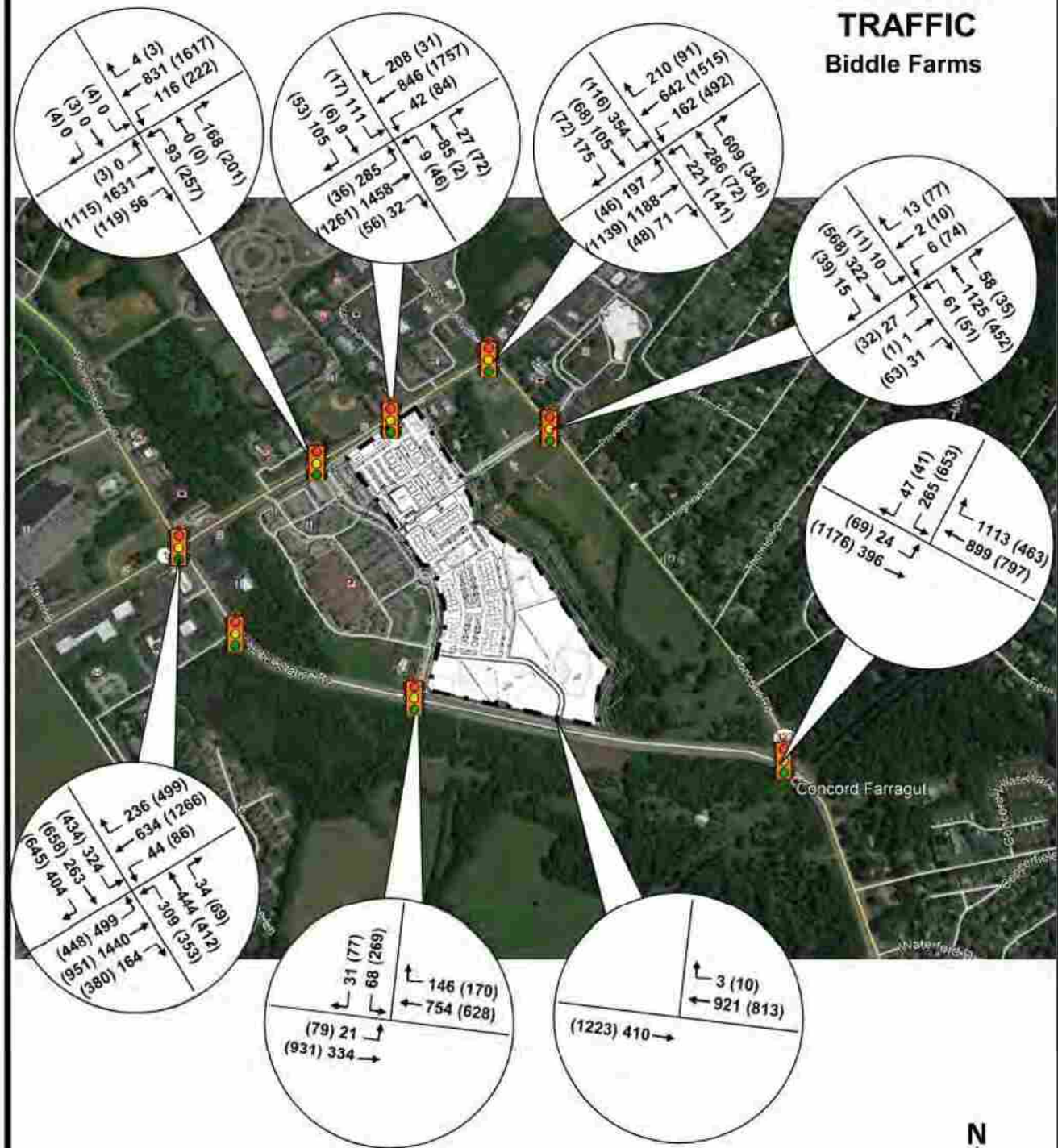
Projected Capacity and Level of Service

Analysis of the 2025 projected traffic was conducted. **Table 7** presents the capacity and levels of service for the study intersections. A summary of the capacity and LOS analyses is presented in **Table 8**. **Figures 15A and 15B** illustrate the lane group levels of service for the study intersections. **Figure 16** illustrates the lane group levels of service with mitigation.

From the analyses conducted, changes in capacity ratios and delays are minimal for the study intersections, and levels of service did not change significantly from the background traffic conditions. Analyses determined that the proposed site development did not result in any significant changes from the analyses conducted for the background traffic conditions which found that the Kingston Pike intersections with Campbell Station Road and Concord Road may experience a LOS F during the PM peak hour and an E during the AM peak hour, respectively; the site impact increase the average intersection delay less than 6 seconds for either intersection and the increase in the V/C ratio not more than 4-percent.

With double left-turn lanes provided for the northbound, southbound, and eastbound approaches of the Kingston Pike and Campbell Station Road intersection, the LOS and intersection capacity may be mitigated to the existing 2020 traffic conditions. For the intersection of Kingston Pike and Concord Road, an added northbound right-turn lane, providing for double right-turn movement would return the intersection to its current 2020 LOS and capacity. The site impact on these intersections are not significant and the need for this mitigation is due to background traffic conditions. The provision of the double left-turn lanes for the intersection of Kingston Pike and Campbell Station Road would be very challenging with design exceptions as previously stated in the background section of this report. The site has a minimal impact on the intersection.

2025 PROJECTED TRAFFIC Biddle Farms



LEGEND
XXX AM PEAK
(XXX) PM PEAK



Figure 14A

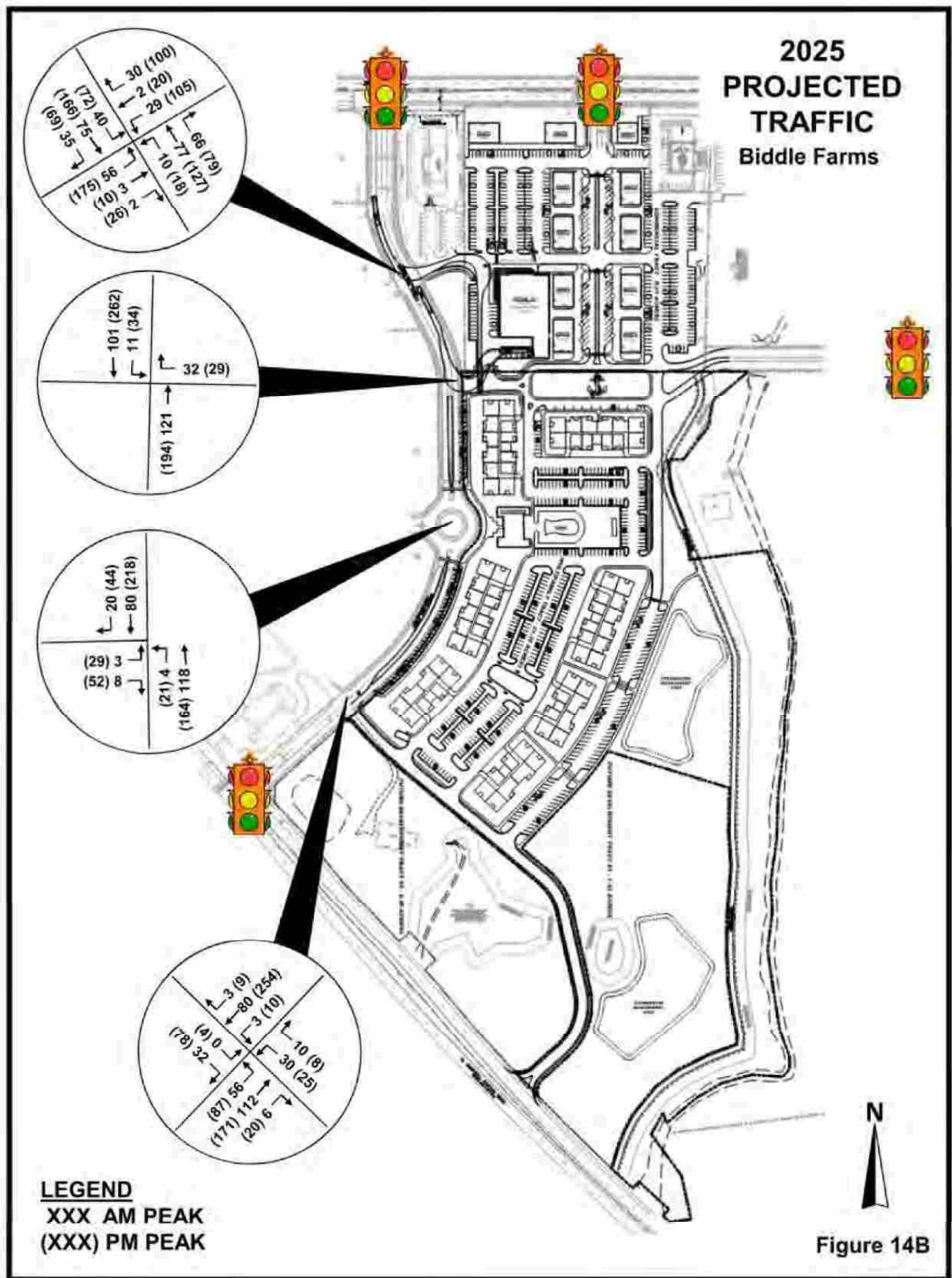


Figure 14B

**Table 7
2025 PROJECTED
CAPACITY AND LEVEL OF SERVICE**

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	w Optimized Signal Timing		
			V/C	DELAY	LOS
Kingston Pike (US 11/70) & Campbell Station Road <i>w NB, SB, and EB Double Left-turn Lanes Mitigation</i>	SIGNAL	AM	1.01	52.6	D
		PM	1.40	101.1	F
		AM	0.86	32.2	C
		PM	1.08	51.2	D
Kingston Pike (US 11/70) & Brooklawn Street	SIGNAL	AM	0.80	12.0	B
		PM	0.80	20.0	B
Kingston Pike (US 11/70) & Lendon Welch Way	SIGNAL	AM	0.82	22.7	C
		PM	0.74	8.4	A
Kingston Pike (US 11/70) & Concord Road (SR 332) <i>w NB Double Right-Turn Lanes Mitigation</i>	SIGNAL	AM	1.08	73.5	E
		PM	0.93	44.7	D
		AM	0.92	45.8	D
		PM	0.93	44.6	D
Campbell Station Road So. & Brooklawn Street	SIGNAL	AM	0.32	5.0	A
		PM	0.51	16.0	B
Campbell Station Road So. & Concord Road (SR 332)	SIGNAL	AM	0.80	22.9	C
		PM	0.66	18.3	B
Concord Road (SR 332) & Site Access	SIGNAL	AM	0.41	4.8	A
		PM	0.45	8.0	A
Brooklawn Street & Petco/Old Kroger Access	STOP EB/WB	AM	0.116/0.092	12.1/10.5	B/B
		PM	0.704/0.502	38.5/19.6	E/C
Brooklawn Street Proposed Grocery/Apartment Access	STOP WB	AM	0.04	9.1	A
		PM	0.04	9.5	A
Brooklawn Street & Kroger Roundabout	Roundabout	AM	0.10	3.4	A
		PM	0.22	4.6	A
Brooklawn Street & Pinnacle Access	STOP EB/WB	AM	0.04/0.07	8.9/11.4	A/B
		PM	0.12/0.11	10.8/17.1	B/C

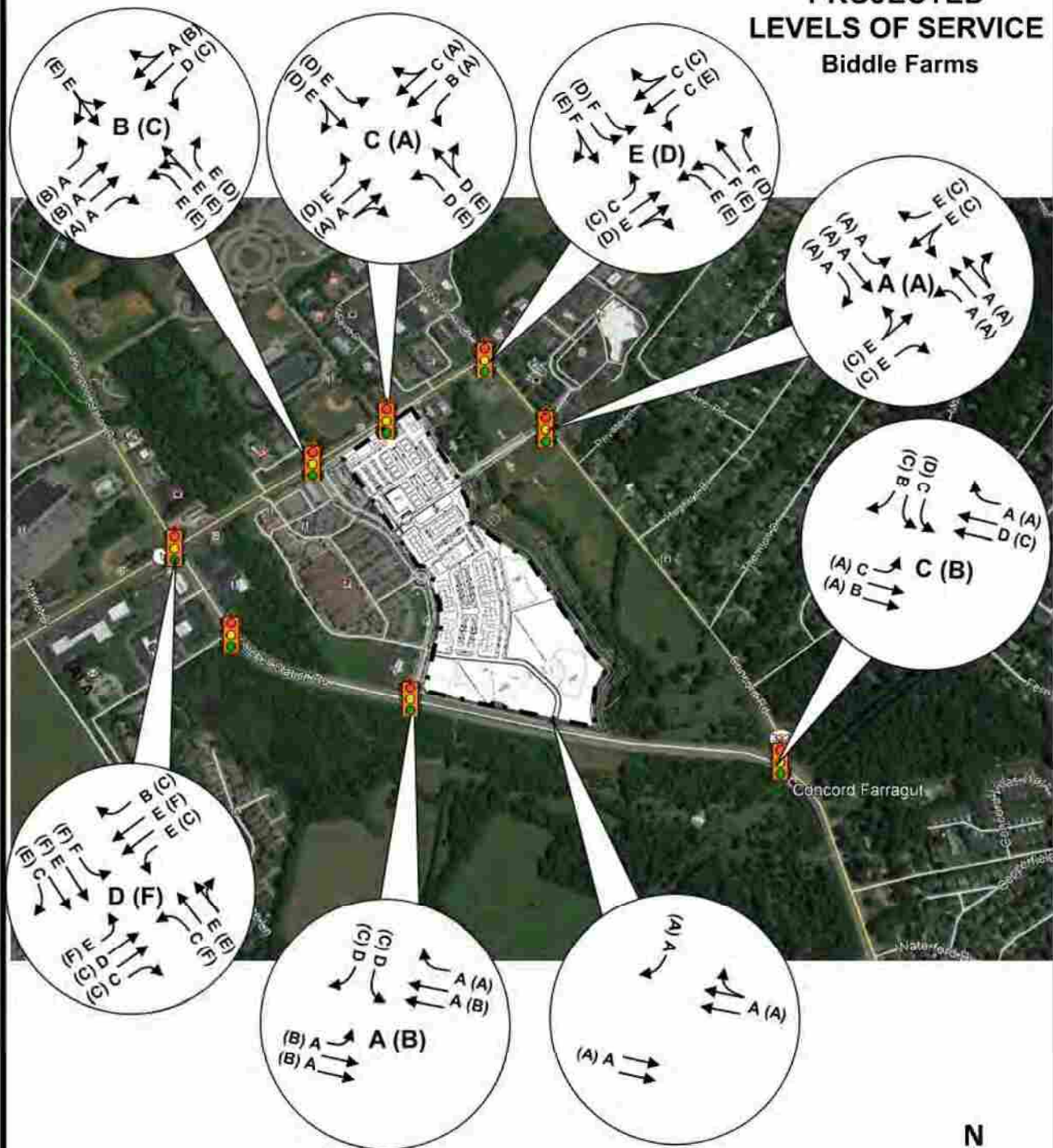
Note: Average vehicle delay estimated in seconds.

**TABLE 8
CAPACITY AND LEVEL OF SERVICE SUMMARY**

INTERSECTION	TRAFFIC CONTROL	PEAK PERIOD	2020 EXISTING TRAFFIC			2025 BACKGROUND TRAFFIC			2025 PROJECTED TRAFFIC		
			V/C	DELAY	LOS	V/C	DELAY	LOS	V/C	DELAY	LOS
Kingston Pike (US 1170) & Campbell Station Road w NB, SB, and EB Double Left-turn Lanes Mitigation	SIGNAL	AM	0.98	37.7	D	0.98	47.6	D	1.01	52.6	D
		PM	1.08	65.5	E	1.36	102.4	F	1.40	101.1	F
		AM				0.85	29.7	C	0.86	32.2	C
		PM				1.07	46.4	D	1.08	51.2	D
Kingston Pike (US 1170) & Brooklawn Street	SIGNAL	AM	0.68	9.7	A	0.70	8.4	A	0.80	12.0	B
		PM	0.65	27.4	C	0.76	15.8	B	0.80	20.0	B
Kingston Pike (US 1170) & Lendon Welch Way	SIGNAL	AM	0.84	18.0	B	0.80	21.5	C	0.82	22.7	C
		PM	0.62	15.0	B	0.71	6.7	A	0.74	8.4	A
Kingston Pike (US 1170) & Concord Road (SR 332) w NB Double Right-Turn Lanes Mitigation	SIGNAL	AM	0.91	40.3	D	1.06	67.8	E	1.08	73.5	E
		PM	0.87	39.2	D	0.91	39.8	D	0.93	44.7	D
		AM				0.92	43.8	D	0.92	45.8	D
		PM				0.91	42.1	D	0.93	44.3	D
Campbell Station Road So. & Brooklawn Street	SIGNAL	AM	0.28	2.7	A	0.31	3.0	A	0.32	5.0	A
		PM	0.47	21.3	C	0.47	14.2	B	0.51	16.0	B
Campbell Station Road So. & Concord Road (SR 332)	SIGNAL	AM	0.62	16.2	B	0.80	22.0	C	0.80	22.9	C
		PM	0.54	17.0	B	0.63	17.7	B	0.66	18.3	B
Concord Road (SR 332) & Site Access	SIGNAL	AM	0.33	3.3	A	0.40	2.7	A	0.41	4.8	A
		PM	0.38	12.6	B	0.42	10.4	B	0.45	8.0	A
Brooklawn Street & Petco/Old Kroger Access	STOP EB/WB	AM	0.087/0.02	10.2/9.4	B/A	0.087/0.02	10.2/9.4	B/A	0.116/0.092	12.1/10.5	B/B
		PM	0.426/0.168	16.5/12.1	C/B	0.426/0.168	16.5/12.1	C/B	0.704/0.502	38.5/19.6	E/C
Brooklawn Street Proposed Grocery/Apartment Access	STOP WB	AM	-	-	-	-	-	-	0.04	9.1	A
		PM	-	-	-	-	-	-	0.04	9.5	A
Brooklawn Street & Kroger Roundabout	Roundabout	AM	0.10	3.4	A	0.06	3.2	A	0.10	3.4	A
		PM	0.16	4.0	A	0.15	4.0	A	0.22	4.6	A
Brooklawn Street & Pinnacle Access	STOP EB/WB	AM	0.04	8.7	A	0.04	8.7	A	0.04/0.07	8.9/11.4	A/B
		PM	0.11	10.1	B	0.11	10.1	B	0.12/0.11	10.8/17.1	B/C

Note: Average vehicle delay estimated in seconds.

**2025
PROJECTED
LEVELS OF SERVICE
Biddle Farms**



LEGEND
C AM PEAK LOS
(C) PM PEAK LOS



Figure 15A

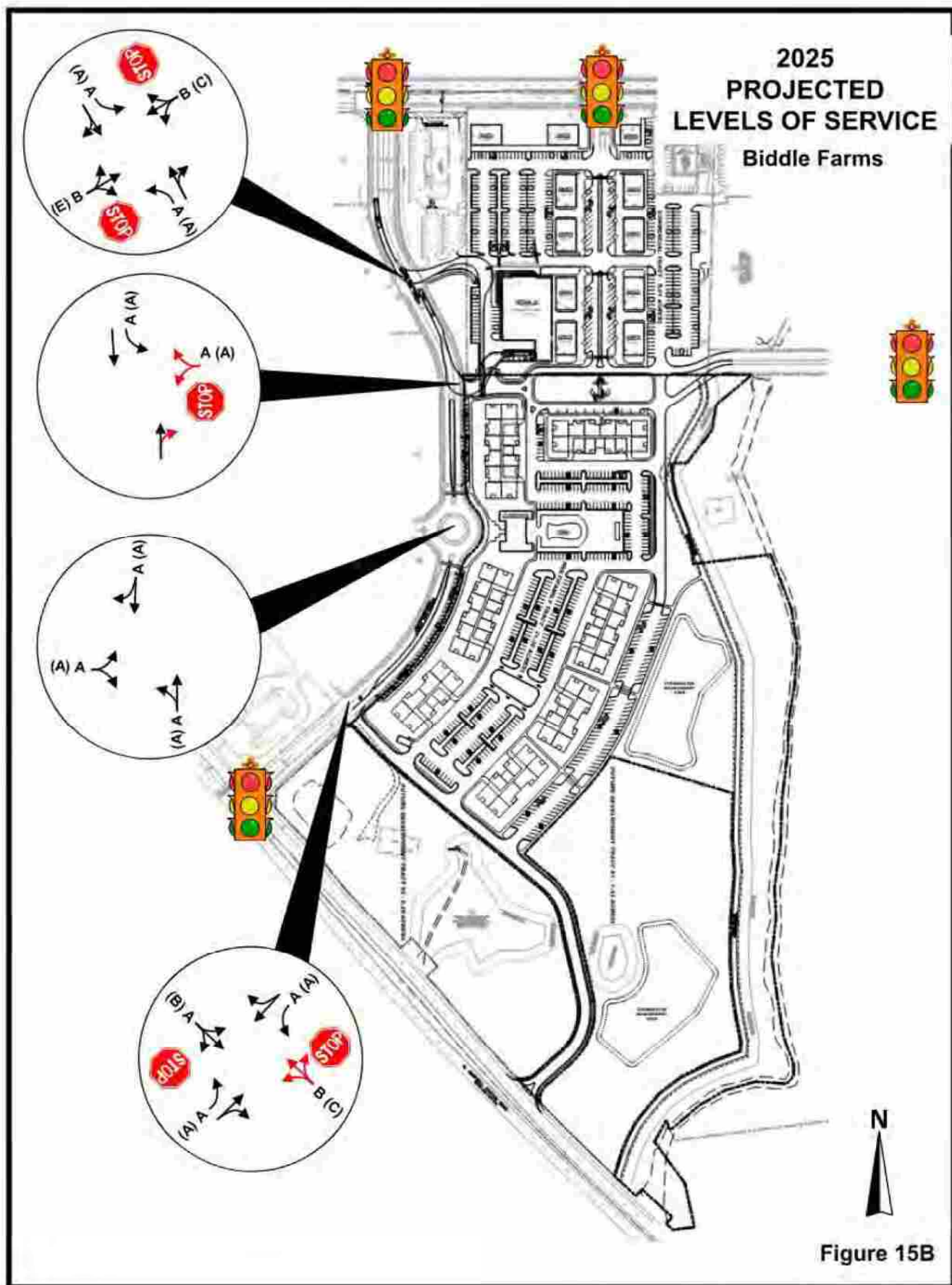
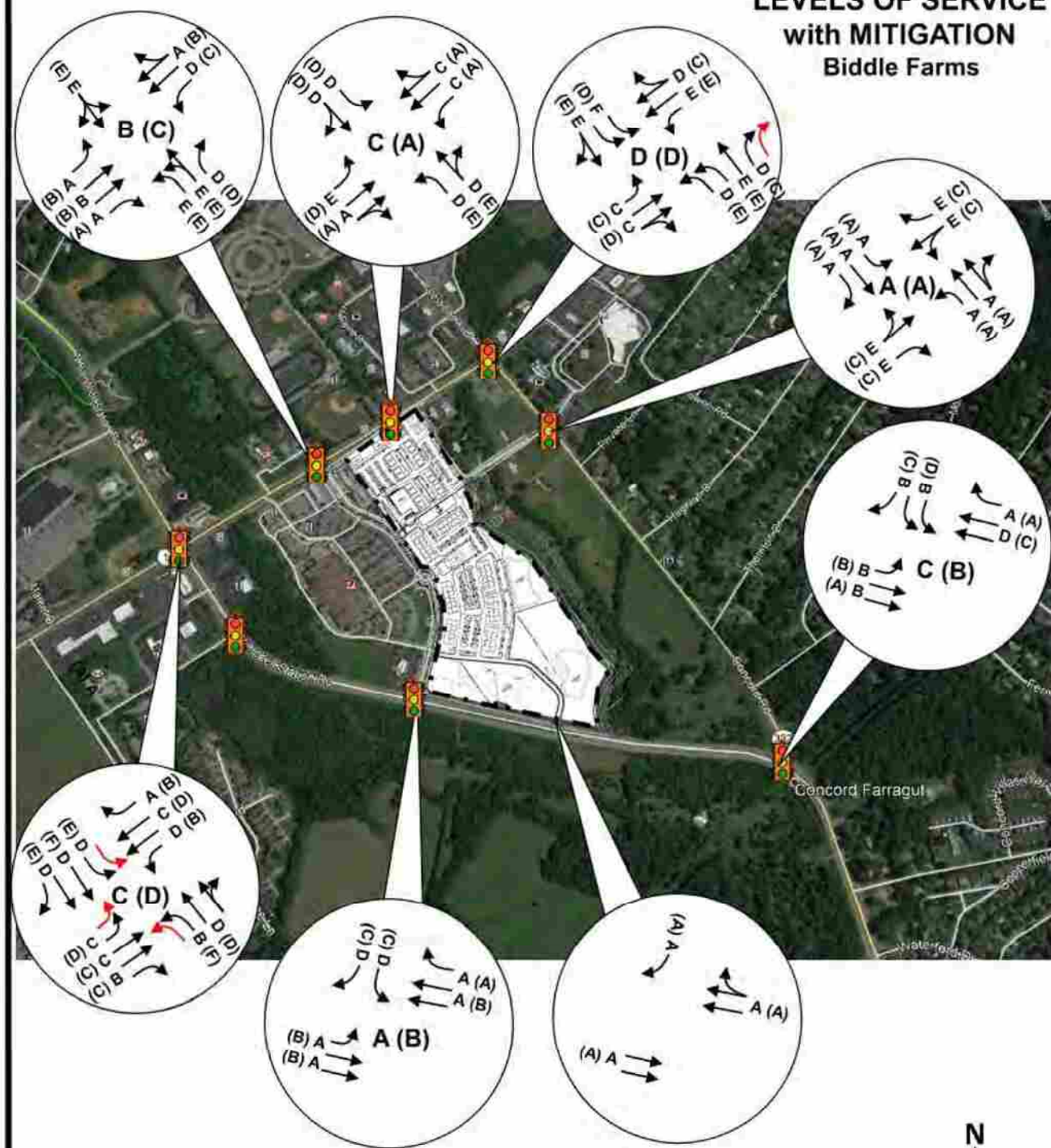


Figure 15B

**2025
PROJECTED
LEVELS OF SERVICE
with MITIGATION
Biddle Farms**



RECOMMENDATIONS

The analyses conducted and the review of the traffic volumes identified the following recommendations:

- Minimize landscaping, using low growing vegetation, and signing at the planned site accesses.

Intersection design should conform to the recommended standards and practices of the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, Tennessee Department of Transportation (TDOT), and the Town of Farragut.

CONCLUSION

The study of the Biddle Farms, a proposed mixed commercial and residential development evaluated the projected traffic conditions. Background traffic was determined using a 3.5-percent annual compounded growth rate until the horizon year 2025. Traffic associated with the proposed project was then generated and distributed to the proposed site accesses. The proposed site may generate approximately 8,480 daily weekday trips. After the consideration of pass-by traffic and internal trips, approximately 6,730 new daily trips (Primary) may be generated for a typical weekday. Using the identified turning movements for the projected traffic conditions, unsignalized and signalized capacity and level of service analyses were conducted using the **2000 Highway Capacity Manual**.

Current conditions for study intersections are LOS E or better. Intersections are operating with a minimum LOS C except for the Kingston Pike intersections with Campbell Station Road and Concord Road. The PM peak hour for the intersection of Kingston Pike at Campbell Station Road is a LOS E and operates over capacity with a V/C ratio of 1.08, thereby an operation that is unstable and experiencing saturated traffic flows resulting in significant congestion with adverse traffic queues. The Kingston Pike intersection with Concord Road is a LOS D during the peak hours with a capacity ratio exceeding 0.90 indicating traffic conditions becoming unstable.

From the analyses conducted, changes in intersection capacity and delays are minimal for the study intersections, and levels of service did not change significantly from the background traffic conditions. Analyses determined that the proposed site development did not result in any significant changes from the analyses conducted for the background traffic conditions which found that the Kingston Pike intersections with Campbell Station Road and Concord Road may experience a LOS F during the PM peak hour and an E during the AM peak hour, respectively; the site impact increase the average intersection delay less than 6 seconds for either intersection and the increase in the V/C ratio not more than 4-percent. The poor levels of service for the Kingston Pike intersections with Campbell Station Road and Concord Road would occur regardless of the proposed development.

The proposed site does not have a significant impact on the adjacent road network as traffic projections and intersection analyses found little impact resulting from the proposed development. This impact is minimized with the proposed signalized accesses available to the site thereby affectively distributing the trips generated by the mixed-use development. The proposed development is a lower trip generator than the zoned property which could possibly develop an

approximate 295,000 square feet of retail uses. The comparison of the trip generation found the proposed site reduces the trip generation potential as compared to the possible development with the current zoning. With the same pass-by rate of 20-percent applied to the trip generation of a 295,000 square foot center, the daily trips generated may be 3,300 fewer daily trips and 390 fewer PM peak hour trips with the proposed mixed commercial and residential development. An additional approximate 75 trips might be generated during the AM peak hour with the mixed-use commercial and residential site but is not significant as it is managed with numerous accesses to the adjacent street network.

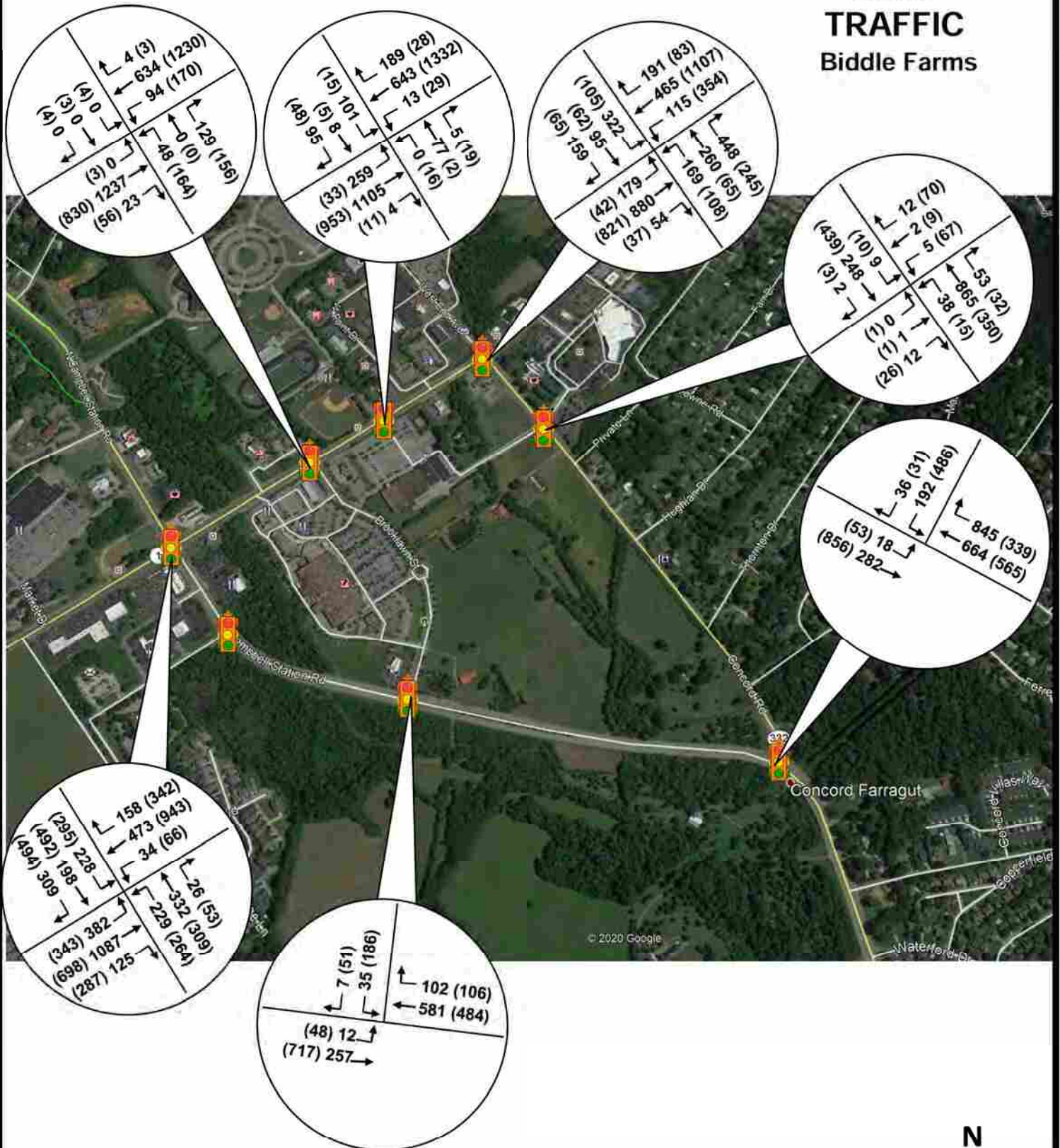
The proposed site access for the site was found to operate at acceptable levels of service; however, the adjacent Kingston Pike intersections with Campbell Station Road and Concord Road may experience lower and unacceptable levels of service as the background traffic will have a significant impact on the intersections' capacities. Background left-turn volumes exceed 300vph for the northbound, southbound, and eastbound approaches of the Kingston Pike and Campbell Station Road intersection thereby requiring double left-turn lanes. Double left-turn lanes for the Kingston Pike and Campbell Station Road intersection would be very difficult with the current development of the intersection corners. The provision of these double left-turn lanes would require several design exceptions if they were to be considered by the Town of Farragut, minimizing any right-of-way required.

Mitigation of background traffic impacts for the of Kingston Pike intersection with Concord Road is an additional northbound right-turn lane. The mitigation of both Kingston Pike intersections with Campbell Station Road and Concord Road would return level of service and capacity back to that currently experienced for the 2020 traffic conditions. The development of the Biddle Farms property did not determine any required mitigation as its impacts were not significant and acceptable levels of service provided for the accesses to the site.

APPENDIX

2016 Traffic
Trip Generation
Synchro Reports
Traffic Count Data

2016 TRAFFIC Biddle Farms



LEGEND

XXX AM PEAK
(XXX) PM PEAK



TRIP GENERATION

21-Oct-20

			AVERAGE						
LAND USE	L.U.C	SIZE	DAILY	AM PEAK		TOTAL	PM PEAK		TOTAL
			TRAFFIC	ENTER	EXIT		ENTER	EXIT	
APARTMENT	220	290	2,123	31	103	133	102	60	162
KNOX CO MULTI-FAMILY	225	290	2,619	35	124	160	115	94	209
0	0	0	0	0	0	0	0	0	0
SHOPPING CENTER	820	42,000	1,586	24	15	39	77	83	160
SUPERMARKET	850	20,442	2,183	47	31	78	96	93	189
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
SHOPPING CENTER	820	62,442	2,357	36	22	59	114	124	238
0	0	0	0	0	0	0	0	0	0
SHOPPING CENTER	820	295,000	11,136	172	105	277	539	584	1,124
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
			22,003	345	401	746	1,044	1,038	2,082

			REGRESSION						
LAND USE	L.U.C	SIZE	DAILY	AM PEAK		TOTAL	PM PEAK		TOTAL
			TRAFFIC	ENTER	EXIT		ENTER	EXIT	
APARTMENT	220	290	2,152	30	101	131	96	56	152
KNOX CO MULTI-FAMILY	225	290	2,485	31	111	143	112	92	204
0	0	0	0	0	0	0	0	0	0
SHOPPING CENTER	820	42,000	3,333	107	66	173	137	149	286
SUPERMARKET	850	20,442	2,662	N/A	N/A	N/A	121	117	238
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
SHOPPING CENTER	820	62,442	4,365	113	70	183	184	199	383
0	0	0	0	0	0	0	0	0	0
SHOPPING CENTER	820	295,000	12,546	186	114	299	581	629	1,210
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
			27,542	468	461	929	1,232	1,242	2,474

			SATURDAY				SUNDAY			
LAND USE	L.U.C	SIZE	DAILY	PEAK		TOTAL	DAILY	PEAK		TOTAL
			TRAFFIC	ENTER	EXIT		TRAFFIC	ENTER	EXIT	
APARTMENT	220	290	3,541	N/A	N/A	280	2,596	N/A	N/A	284
KNOX CO MULTI-FAMILY	225	290	1,853	74	77	151	170	77	71	148
0	0	0	0	0	0	0	0	0	0	0
SHOPPING CENTER	820	42,000	5,205	162	150	312	886	57	60	117
SUPERMARKET	850	20,442	3,631	108	104	211	3,403	N/A	N/A	387
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
SHOPPING CENTER	820	62,442	6,656	222	205	427	1,318	85	89	174
0	0	0	0	0	0	0	0	0	0	0
SHOPPING CENTER	820	295,000	17,430	757	698	1,455	6,225	403	420	823
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
			38,315	1,322	1,233	2,836	14,597	623	639	1,934

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	207	1081	135	768	190	292	503	389	307
v/c Ratio	0.63	0.96	0.48	0.65	0.47	0.88	0.83	0.91	0.83
Control Delay	26.1	38.1	29.9	28.4	45.8	65.6	23.3	71.0	48.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.1	38.1	29.9	28.4	45.8	65.6	23.3	71.0	48.0
Queue Length 50th (ft)	84	360	61	197	60	182	58	128	141
Queue Length 95th (ft)	m112	#497	108	263	#105	#326	#116	#220	#237
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	331	1124	295	1180	400	343	620	427	430
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.96	0.46	0.65	0.47	0.85	0.81	0.91	0.71

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.























Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	197	968	59	127	512	210	186	286	493	354	105	175
Future Volume (vph)	197	968	59	127	512	210	186	286	493	354	105	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	0.96		1.00	1.00	0.85	1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3513		1687	3325		3433	1900	1599	3502	1705	
Flt Permitted	0.36	1.00		0.18	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	685	3513		327	3325		3433	1900	1599	3502	1705	
Peak-hour factor, PHF	0.95	0.95	0.95	0.94	0.94	0.94	0.98	0.98	0.98	0.91	0.91	0.91
Adj. Flow (vph)	207	1019	62	135	545	223	190	292	503	389	115	192
RTOR Reduction (vph)	0	4	0	0	44	0	0	0	126	0	63	0
Lane Group Flow (vph)	207	1077	0	135	724	0	190	292	377	389	244	0
Heavy Vehicles (%)	0%	2%	0%	7%	5%	1%	2%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6					8			
Actuated Green, G (s)	31.8	31.8		34.1	34.1		11.7	17.5	29.9	12.3	18.1	
Effective Green, g (s)	31.8	31.8		34.1	34.1		11.7	17.5	29.9	12.3	18.1	
Actuated g/C Ratio	0.32	0.32		0.34	0.34		0.12	0.18	0.30	0.12	0.18	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	330	1117		280	1133		401	332	478	430	308	
v/s Ratio Prot	0.06	c0.31		0.06	c0.22		0.06	c0.15	0.10	c0.11	0.14	
v/s Ratio Perm	0.14			0.10					0.14			
v/c Ratio	0.63	0.96		0.48	0.64		0.47	0.88	0.79	0.90	0.79	
Uniform Delay, d1	31.0	33.5		25.3	27.8		41.3	40.2	32.1	43.3	39.2	
Progression Factor	0.57	0.60		1.00	1.00		0.97	0.97	0.89	1.00	1.00	
Incremental Delay, d2	2.8	16.3		1.3	2.8		0.9	21.6	8.1	22.0	13.0	
Delay (s)	20.6	36.4		26.6	30.5		40.9	60.4	36.8	65.3	52.2	
Level of Service	C	D		C	C		D	E	D	E	D	
Approach Delay (s)		33.9			29.9			44.6			59.5	
Approach LOS		C			C			D			E	
Intersection Summary												
HCM 2000 Control Delay			40.3			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			26.0			
Intersection Capacity Utilization			85.5%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	457	1300	150	40	559	187	271	423	326	283	442
v/c Ratio	0.86	0.88	0.20	0.24	0.80	0.30	0.68	0.66	0.88	0.42	0.59
Control Delay	48.9	37.0	2.7	21.9	34.7	7.6	25.2	35.8	50.6	37.3	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.9	37.0	2.7	21.9	34.7	7.6	25.2	35.8	50.6	37.3	10.1
Queue Length 50th (ft)	247	427	0	17	197	46	138	134	154	84	59
Queue Length 95th (ft)	#470	#585	27	38	#265	69	242	184	#206	104	78
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	533	1475	735	169	701	620	406	640	371	679	752
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.88	0.20	0.24	0.80	0.30	0.67	0.66	0.88	0.42	0.59

























Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	420	1196	138	37	520	174	252	365	29	251	218	340
Future Volume (vph)	420	1196	138	37	520	174	252	365	29	251	218	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3574	1524	1805	3505	1599	1719	3527		1752	3406	1553
Flt Permitted	0.44	1.00	1.00	0.28	1.00	1.00	0.58	1.00		0.33	1.00	1.00
Satd. Flow (perm)	801	3574	1524	528	3505	1599	1046	3527		605	3406	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.77	0.77	0.77
Adj. Flow (vph)	457	1300	150	40	559	187	271	392	31	326	283	442
RTOR Reduction (vph)	0	0	92	0	0	74	0	6	0	0	0	100
Lane Group Flow (vph)	457	1300	58	40	559	113	271	417	0	326	283	342
Heavy Vehicles (%)	4%	1%	6%	0%	3%	1%	5%	1%	4%	3%	6%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	38.7	38.7	38.7	17.4	17.4	31.7	30.4	18.0		34.2	19.9	44.2
Effective Green, g (s)	38.7	38.7	38.7	17.4	17.4	31.7	30.4	18.0		34.2	19.9	44.2
Actuated g/C Ratio	0.39	0.39	0.39	0.17	0.17	0.32	0.30	0.18		0.34	0.20	0.44
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	537	1383	589	130	609	506	401	634		370	677	686
v/s Ratio Prot	0.21	c0.36		0.01	c0.16	0.03	0.08	0.12		c0.13	0.08	0.12
v/s Ratio Perm	0.12		0.04	0.04		0.04	0.12			c0.17		0.10
v/c Ratio	0.85	0.94	0.10	0.31	0.92	0.22	0.68	0.66		0.88	0.42	0.50
Uniform Delay, d1	27.9	29.5	19.5	35.4	40.6	25.1	28.8	38.1		27.3	35.0	20.0
Progression Factor	1.00	1.00	1.00	0.57	0.66	1.20	0.68	0.81		1.00	1.00	1.00
Incremental Delay, d2	12.3	13.6	0.3	1.3	20.7	0.2	4.4	5.2		20.9	1.9	0.6
Delay (s)	40.2	43.1	19.9	21.3	47.4	30.2	23.9	36.0		48.3	36.9	20.5
Level of Service	D	D	B	C	D	C	C	D		D	D	C
Approach Delay (s)		40.6			42.0			31.3			33.5	
Approach LOS		D			D			C			C	

Intersection Summary

HCM 2000 Control Delay	37.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	154	441	46	655
v/c Ratio	0.62	0.18	0.07	0.25
Control Delay	45.1	4.6	0.8	0.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	45.1	4.6	0.8	0.9
Queue Length 50th (ft)	79	5	1	8
Queue Length 95th (ft)	99	122	2	8
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	605	2510	698	2572
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.25	0.18	0.07	0.25
Intersection Summary				

HCM Signalized Intersection Capacity Analysis 5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	75	33	281	89	41	583
Future Volume (vph)	75	33	281	89	41	583
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.96		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1761		3364		1805	3471
Flt Permitted	0.97		1.00		0.50	1.00
Satd. Flow (perm)	1761		3364		943	3471
Peak-hour factor, PHF	0.70	0.70	0.84	0.84	0.89	0.89
Adj. Flow (vph)	107	47	335	106	46	655
RTOR Reduction (vph)	21	0	17	0	0	0
Lane Group Flow (vph)	133	0	424	0	46	655
Heavy Vehicles (%)	0%	0%	2%	8%	0%	4%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	12.9		74.1		74.1	74.1
Effective Green, g (s)	12.9		74.1		74.1	74.1
Actuated g/C Ratio	0.13		0.74		0.74	0.74
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	227		2492		698	2572
v/s Ratio Prot	c0.08		0.13			c0.19
v/s Ratio Perm					0.05	
v/c Ratio	0.59		0.17		0.07	0.25
Uniform Delay, d1	41.0		3.8		3.5	4.1
Progression Factor	1.00		1.23		0.14	0.14
Incremental Delay, d2	3.8		0.1		0.2	0.2
Delay (s)	44.9		4.8		0.7	0.8
Level of Service	D		A		A	A
Approach Delay (s)	44.9		4.8			0.8
Approach LOS	D		A			A
Intersection Summary						
HCM 2000 Control Delay			7.4		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.30			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	13.0
Intersection Capacity Utilization			37.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	16	345	695	122	48	10
v/c Ratio	0.03	0.15	0.33	0.08	0.11	0.03
Control Delay	1.8	2.0	1.0	0.1	31.0	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1.8	2.0	1.0	0.1	31.0	15.9
Queue Length 50th (ft)	1	11	5	0	24	0
Queue Length 95th (ft)	3	13	9	0	49	11
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	510	2230	2117	1512	424	387
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.15	0.33	0.08	0.11	0.03
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↱↱	↱↱	↰	↰	↰
Traffic Volume (vph)	13	283	639	112	39	8
Future Volume (vph)	13	283	639	112	39	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3406	3505	1615	1805	1615
Flt Permitted	0.32	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	606	3406	3505	1615	1805	1615
Peak-hour factor, PHF	0.82	0.82	0.92	0.92	0.81	0.81
Adj. Flow (vph)	16	345	695	122	48	10
RTOR Reduction (vph)	0	0	0	24	0	8
Lane Group Flow (vph)	16	345	695	98	48	2
Heavy Vehicles (%)	0%	6%	3%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	65.5	65.5	56.5	80.0	23.5	23.5
Effective Green, g (s)	65.5	65.5	56.5	80.0	23.5	23.5
Actuated g/C Ratio	0.66	0.66	0.56	0.80	0.24	0.24
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	426	2230	1980	1292	424	379
v/s Ratio Prot	0.00	c0.10	c0.20	0.02	c0.03	
v/s Ratio Perm	0.02			0.04		0.00
v/c Ratio	0.04	0.15	0.35	0.08	0.11	0.01
Uniform Delay, d1	6.6	6.6	11.8	2.1	30.1	29.3
Progression Factor	0.29	0.28	0.06	0.01	1.00	1.00
Incremental Delay, d2	0.0	0.1	0.4	0.1	0.5	0.0
Delay (s)	1.9	2.0	1.2	0.1	30.6	29.3
Level of Service	A	A	A	A	C	C
Approach Delay (s)		2.0	1.0		30.4	
Approach LOS		A	A		C	

Intersection Summary

HCM 2000 Control Delay	2.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	31.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	26	397	760	969	229	43
v/c Ratio	0.10	0.25	0.55	0.63	0.15	0.06
Control Delay	14.1	15.6	26.8	2.2	17.4	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.1	15.6	26.8	2.2	17.4	5.4
Queue Length 50th (ft)	13	108	178	0	44	0
Queue Length 95th (ft)	16	120	285	27	68	20
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	258	1570	1376	1547	1523	726
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.25	0.55	0.63	0.15	0.06

Intersection Summary

HCM Signalized Intersection Capacity Analysis 11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	20	310	730	930	211	40
Future Volume (vph)	20	310	730	930	211	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1671	3610	3539	1599	3502	1615
Flt Permitted	0.26	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	453	3610	3539	1599	3502	1615
Peak-hour factor, PHF	0.78	0.78	0.96	0.96	0.92	0.92
Adj. Flow (vph)	26	397	760	969	229	43
RTOR Reduction (vph)	0	0	0	189	0	24
Lane Group Flow (vph)	26	397	760	780	229	19
Heavy Vehicles (%)	8%	0%	2%	1%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	43.5	43.5	35.0	78.5	43.5	43.5
Effective Green, g (s)	43.5	43.5	35.0	78.5	43.5	43.5
Actuated g/C Ratio	0.44	0.44	0.35	0.78	0.44	0.44
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	221	1570	1238	1359	1523	702
v/s Ratio Prot	0.00	c0.11	0.21	c0.25	0.07	
v/s Ratio Perm	0.05			0.24		0.01
v/c Ratio	0.12	0.25	0.61	0.57	0.15	0.03
Uniform Delay, d1	24.5	17.9	26.9	4.2	17.1	16.1
Progression Factor	0.75	0.84	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.4	2.3	1.8	0.2	0.1
Delay (s)	18.5	15.5	29.2	6.0	17.3	16.2
Level of Service	B	B	C	A	B	B
Approach Delay (s)		15.7	16.2		17.1	
Approach LOS		B	B		B	
Intersection Summary						
HCM 2000 Control Delay			16.2		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.62			
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	19.5
Intersection Capacity Utilization			72.2%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Queues

16: Concord Rd & Site Access

10/27/2020



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	2	28	13	21	44	1052	11	310	2
v/c Ratio	0.02	0.22	0.13	0.17	0.04	0.33	0.02	0.18	0.00
Control Delay	43.0	20.3	46.4	20.8	1.4	1.6	1.0	1.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.0	20.3	46.4	20.8	1.4	1.6	1.0	1.0	0.0
Queue Length 50th (ft)	1	0	8	0	3	49	0	14	0
Queue Length 95th (ft)	4	5	19	13	8	75	m1	m26	m0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	427	385	360	379	982	3205	460	1700	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.07	0.04	0.06	0.04	0.33	0.02	0.18	0.00

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↗	↘		↗	↘	↗	↘	↗	↘	↗	↘
Traffic Volume (vph)	0	1	13	6	2	13	42	952	58	10	273	2
Future Volume (vph)	0	1	13	6	2	13	42	952	58	10	273	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		1.00	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1900	1615		1830	1615	1805	3546		1805	1881	1615
Flt Permitted		1.00	1.00		0.84	1.00	0.57	1.00		0.27	1.00	1.00
Satd. Flow (perm)		1900	1615		1601	1615	1086	3546		509	1881	1615
Peak-hour factor, PHF	0.46	0.46	0.46	0.63	0.63	0.63	0.96	0.96	0.96	0.88	0.88	0.88
Adj. Flow (vph)	0	2	28	10	3	21	44	992	60	11	310	2
RTOR Reduction (vph)	0	0	27	0	0	20	0	2	0	0	0	0
Lane Group Flow (vph)	0	2	1	0	13	1	44	1050	0	11	310	2
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type		NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		4.2	4.2		4.2	4.2	86.8	86.8		86.8	86.8	91.0
Effective Green, g (s)		4.2	4.2		4.2	4.2	86.8	86.8		86.8	86.8	91.0
Actuated g/C Ratio		0.04	0.04		0.04	0.04	0.87	0.87		0.87	0.87	0.91
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		79	67		67	67	942	3077		441	1632	1615
v/s Ratio Prot		0.00						c0.30			0.16	0.00
v/s Ratio Perm			0.00		c0.01	0.00	0.04			0.02		0.00
v/c Ratio		0.03	0.02		0.19	0.01	0.05	0.34		0.02	0.19	0.00
Uniform Delay, d1		45.9	45.9		46.3	45.9	0.9	1.2		0.9	1.0	0.4
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.67	0.66	1.00
Incremental Delay, d2		0.1	0.1		1.4	0.1	0.1	0.3		0.1	0.2	0.0
Delay (s)		46.1	46.0		47.7	46.0	1.0	1.5		0.7	0.9	0.4
Level of Service		D	D		D	D	A	A		A	A	A
Approach Delay (s)		46.0			46.6			1.5			0.9	
Approach LOS		D			D			A			A	

Intersection Summary

HCM 2000 Control Delay	3.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	306	1312	16	1039	154	281
v/c Ratio	0.82	0.64	0.07	0.77	0.33	0.80
Control Delay	43.0	4.0	5.4	17.6	32.6	48.0
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	43.0	4.1	5.4	17.6	32.6	48.0
Queue Length 50th (ft)	90	15	1	178	79	145
Queue Length 95th (ft)	#229	24	m2	264	84	#210
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	409	2062	215	1345	467	353
Starvation Cap Reductn	0	143	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.68	0.07	0.77	0.33	0.80

Intersection Summary





95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 18: Kingston Pike & Lendon Welsch Way

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	1216	4	14	707	208	0	85	6	111	9	105
Future Volume (vph)	285	1216	4	14	707	208	0	85	6	111	9	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	0.97			0.99			0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1687	3573		1805	3360			1883			1697	
Flt Permitted	0.12	1.00		0.17	1.00			1.00			0.75	
Satd. Flow (perm)	206	3573		320	3360			1883			1302	
Peak-hour factor, PHF	0.93	0.93	0.93	0.88	0.88	0.88	0.59	0.59	0.59	0.80	0.80	0.80
Adj. Flow (vph)	306	1308	4	16	803	236	0	144	10	139	11	131
RTOR Reduction (vph)	0	0	0	0	26	0	0	2	0	0	32	0
Lane Group Flow (vph)	306	1312	0	16	1013	0	0	152	0	0	249	0
Heavy Vehicles (%)	7%	1%	0%	0%	4%	3%	0%	0%	0%	1%	0%	4%
Turn Type	pm+pt	NA		pm+pt	NA			NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	62.3	53.8		41.3	39.3			24.7			24.7	
Effective Green, g (s)	62.3	53.8		41.3	39.3			24.7			24.7	
Actuated g/C Ratio	0.62	0.54		0.41	0.39			0.25			0.25	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	372	1922		161	1320			465			321	
v/s Ratio Prot	c0.14	0.37		0.00	0.30			0.08				
v/s Ratio Perm	c0.38			0.04							c0.19	
v/c Ratio	0.82	0.68		0.10	0.77			0.33			0.78	
Uniform Delay, d1	23.3	16.9		17.7	26.4			30.8			35.1	
Progression Factor	1.43	0.18		0.51	0.52			1.00			1.00	
Incremental Delay, d2	10.9	1.5		0.2	3.7			1.9			11.2	
Delay (s)	44.2	4.6		9.2	17.4			32.7			46.3	
Level of Service	D	A		A	B			C			D	
Approach Delay (s)		12.1			17.3			32.7			46.3	
Approach LOS		B			B			C			D	
Intersection Summary												
HCM 2000 Control Delay			18.0			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			19.5			
Intersection Capacity Utilization			77.9%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	1479	27	111	753	30	30	160
v/c Ratio	0.66	0.02	0.46	0.28	0.24	0.24	0.38
Control Delay	8.4	0.0	11.5	2.4	47.8	47.8	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.4	0.0	11.5	2.4	47.8	47.8	2.8
Queue Length 50th (ft)	231	0	16	39	18	18	0
Queue Length 95th (ft)	530	m0	m20	63	48	48	1
Internal Link Dist (ft)	937			449		417	
Turn Bay Length (ft)		100	125		200		200
Base Capacity (vph)	2254	1151	241	2675	308	308	419
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.02	0.46	0.28	0.10	0.10	0.38






















Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis





22: Brooklawn St & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1361	25	103	697	4	53	0	142	0	0	0
Future Volume (vph)	0	1361	25	103	697	4	53	0	142	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5			
Lane Util. Factor		0.95	1.00	1.00	0.95		0.95	0.95	1.00			
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85			
Flt Protected		1.00	1.00	0.95	1.00		0.95	0.95	1.00			
Satd. Flow (prot)		3539	1615	1805	3498		1715	1715	1599			
Flt Permitted		1.00	1.00	0.11	1.00		0.95	0.95	1.00			
Satd. Flow (perm)		3539	1615	214	3498		1715	1715	1599			
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.89	0.89	0.89	0.25	0.25	0.25
Adj. Flow (vph)	0	1479	27	111	749	4	60	0	160	0	0	0
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	142	0	0	0
Lane Group Flow (vph)	0	1479	17	111	753	0	30	30	18	0	0	0
Heavy Vehicles (%)	0%	2%	0%	0%	3%	25%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov			
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)		59.8	62.8	71.3	71.3		6.2	6.2	11.2			
Effective Green, g (s)		59.8	62.8	71.3	71.3		6.2	6.2	11.2			
Actuated g/C Ratio		0.60	0.63	0.71	0.71		0.06	0.06	0.11			
Clearance Time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5			
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		2116	1014	232	2494		106	106	179			
v/s Ratio Prot		c0.42	c0.00	c0.02	0.22		c0.02	0.02	0.01			
v/s Ratio Perm			0.01	0.32					0.01			
v/c Ratio		0.70	0.02	0.48	0.30		0.28	0.28	0.10			
Uniform Delay, d1		13.9	7.0	20.8	5.2		44.8	44.8	39.9			
Progression Factor		0.56	1.00	0.50	0.42		1.00	1.00	1.00			
Incremental Delay, d2		0.9	0.0	0.9	0.2		1.5	1.5	0.2			
Delay (s)		8.6	7.0	11.4	2.4		46.2	46.2	40.1			
Level of Service		A	A	B	A		D	D	D			
Approach Delay (s)		8.6			3.6			41.8			0.0	
Approach LOS		A			A			D			A	
Intersection Summary												
HCM 2000 Control Delay			9.7			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			63.7%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Int Delay, s/veh 3.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	32	56	77	58	3
Future Vol, veh/h	0	32	56	77	58	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	75	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	35	61	84	63	3







Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	271	65	66
Stage 1	65	-	-
Stage 2	206	-	-
Critical Hdwy	6.42	6.22	4.12
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.318	2.218
Pot Cap-1 Maneuver	718	999	1536
Stage 1	958	-	-
Stage 2	829	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	689	999	1536
Mov Cap-2 Maneuver	689	-	-
Stage 1	920	-	-
Stage 2	829	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	3.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1536	-	999	-
HCM Lane V/C Ratio	0.04	-	0.035	-
HCM Control Delay (s)	7.4	-	8.7	-
HCM Lane LOS	A	-	A	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-

Intersection

Int Delay, s/veh 3.5

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	10	61	35	10	35	31	56	3	2	7	2	6
Future Vol, veh/h	10	61	35	10	35	31	56	3	2	7	2	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	66	38	11	38	34	61	3	2	8	2	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	72	0	0	104	0	0	189	201	85	187	203	55
Stage 1	-	-	-	-	-	-	107	107	-	77	77	-
Stage 2	-	-	-	-	-	-	82	94	-	110	126	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1528	-	-	1488	-	-	771	695	974	774	693	1012
Stage 1	-	-	-	-	-	-	898	807	-	932	831	-
Stage 2	-	-	-	-	-	-	926	817	-	895	792	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1528	-	-	1488	-	-	756	685	974	761	683	1012
Mov Cap-2 Maneuver	-	-	-	-	-	-	756	685	-	761	683	-
Stage 1	-	-	-	-	-	-	892	801	-	925	825	-
Stage 2	-	-	-	-	-	-	911	811	-	883	786	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.7	1	10.2	9.4
HCM LOS			B	A

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	758	1488	-	-	1528	-	831
HCM Lane V/C Ratio	0.087	0.007	-	-	0.007	-	0.02
HCM Control Delay (s)	10.2	7.4	-	-	7.4	-	9.4
HCM Lane LOS	B	A	-	-	A	-	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	0.1

HCM 6th Roundabout
26: Brooklawn St & Kroger Roundabout

10/27/2020

Intersection			
Intersection Delay, s/veh	3.1		
Intersection LOS	A		
Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	12	83	82
Demand Flow Rate, veh/h	12	85	83
Vehicles Circulating, veh/h	61	3	4
Vehicles Exiting, veh/h	26	70	84
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	2.8	3.2	3.1
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	12	85	83
Cap Entry Lane, veh/h	1297	1376	1374
Entry HV Adj Factor	1.000	0.981	0.986
Flow Entry, veh/h	12	83	82
Cap Entry, veh/h	1297	1350	1354
V/C Ratio	0.009	0.062	0.060
Control Delay, s/veh	2.8	3.2	3.1
LOS	A	A	A
95th %tile Queue, veh	0	0	0

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	49	1015	414	1393	129	78	293	178	216
v/c Ratio	0.26	0.78	0.90	0.71	0.54	0.50	0.57	0.36	0.82
Control Delay	17.6	41.2	55.0	23.6	64.6	64.8	19.7	52.4	68.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	41.2	55.0	23.6	64.6	64.8	19.7	52.4	68.3
Queue Length 50th (ft)	15	403	257	449	52	61	81	68	142
Queue Length 95th (ft)	31	#495	#431	540	86	110	138	76	150
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	186	1296	490	1971	253	270	538	489	288
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.78	0.84	0.71	0.51	0.29	0.54	0.36	0.75























Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	46	903	41	389	1218	91	119	72	270	116	68	72
Future Volume (vph)	46	903	41	389	1218	91	119	72	270	116	68	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3498		1770	3502		3335	1827	1538	3502	1745	
Flt Permitted	0.15	1.00		0.10	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	283	3498		180	3502		3335	1827	1538	3502	1745	
Peak-hour factor, PHF	0.93	0.93	0.93	0.94	0.94	0.94	0.92	0.92	0.92	0.65	0.65	0.65
Adj. Flow (vph)	49	971	44	414	1296	97	129	78	293	178	105	111
RTOR Reduction (vph)	0	3	0	0	4	0	0	0	62	0	31	0
Lane Group Flow (vph)	49	1012	0	414	1389	0	129	78	231	178	185	0
Heavy Vehicles (%)	0%	2%	14%	2%	2%	2%	5%	4%	5%	0%	1%	0%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6					8			
Actuated Green, G (s)	49.4	44.9		78.6	67.6		10.3	9.4	36.6	17.5	16.6	
Effective Green, g (s)	49.4	44.9		78.6	67.6		10.3	9.4	36.6	17.5	16.6	
Actuated g/C Ratio	0.40	0.36		0.63	0.54		0.08	0.08	0.29	0.14	0.13	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	166	1256		459	1893		274	137	450	490	231	
v/s Ratio Prot	0.01	0.29		c0.20	0.40		c0.04	0.04	0.11	0.05	c0.11	
v/s Ratio Perm	0.11			c0.37					0.04			
v/c Ratio	0.30	0.81		0.90	0.73		0.47	0.57	0.51	0.36	0.80	
Uniform Delay, d1	24.0	36.1		35.3	21.8		54.7	55.8	36.8	48.7	52.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	5.6		20.6	2.6		1.3	5.3	1.0	0.5	17.4	
Delay (s)	25.0	41.7		56.0	24.4		56.0	61.2	37.8	49.2	70.0	
Level of Service	C	D		E	C		E	E	D	D	E	
Approach Delay (s)		41.0			31.6			46.1			60.6	
Approach LOS		D			C			D			E	
Intersection Summary												
HCM 2000 Control Delay			39.2			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)			26.0			
Intersection Capacity Utilization			81.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	410	835	343	79	1127	409	315	433	353	588	590
v/c Ratio	1.08	0.53	0.38	0.30	1.09	0.47	0.94	0.75	0.97	1.01	0.87
Control Delay	106.5	27.1	3.6	20.6	97.9	14.7	71.2	57.3	73.8	92.5	44.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	106.5	27.1	3.6	20.6	97.9	14.7	71.2	57.3	73.8	92.5	44.4
Queue Length 50th (ft)	~321	261	0	31	~540	132	201	172	222	~257	382
Queue Length 95th (ft)	#526	325	55	57	#676	218	#383	232	#401	#382	#602
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	378	1582	897	261	1033	863	335	578	364	580	679
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.08	0.53	0.38	0.30	1.09	0.47	0.94	0.75	0.97	1.01	0.87

























Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	377	768	316	73	1037	376	290	340	58	325	541	543
Future Volume (vph)	377	768	316	73	1037	376	290	340	58	325	541	543
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3462		1770	3539	1583
Flt Permitted	0.09	1.00	1.00	0.34	1.00	1.00	0.20	1.00		0.29	1.00	1.00
Satd. Flow (perm)	173	3539	1583	629	3539	1583	363	3462		539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	410	835	343	79	1127	409	315	370	63	353	588	590
RTOR Reduction (vph)	0	0	193	0	0	79	0	11	0	0	0	57
Lane Group Flow (vph)	410	835	150	79	1127	330	315	422	0	353	588	533
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	65.5	54.6	54.6	40.9	36.5	56.0	40.0	20.5		40.0	20.5	43.0
Effective Green, g (s)	65.5	54.6	54.6	40.9	36.5	56.0	40.0	20.5		40.0	20.5	43.0
Actuated g/C Ratio	0.52	0.44	0.44	0.33	0.29	0.45	0.32	0.16		0.32	0.16	0.34
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	378	1545	691	245	1033	791	335	567		364	580	626
v/s Ratio Prot	c0.20	0.24		0.01	0.32	0.06	0.15	0.12		c0.15	0.17	c0.15
v/s Ratio Perm	c0.37		0.09	0.09		0.14	0.15			0.16		0.18
v/c Ratio	1.08	0.54	0.22	0.32	1.09	0.42	0.94	0.74		0.97	1.01	0.85
Uniform Delay, d1	39.8	26.0	21.9	29.6	44.2	23.4	36.3	49.8		37.4	52.2	38.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	70.9	1.4	0.7	0.8	56.2	0.4	33.9	8.6		38.7	40.9	10.8
Delay (s)	110.7	27.3	22.6	30.4	100.4	23.8	70.2	58.4		76.1	93.1	48.8
Level of Service	F	C	C	C	F	C	E	E		E	F	D
Approach Delay (s)		47.8			77.6			63.3			72.1	
Approach LOS		D			E			E			E	
Intersection Summary												
HCM 2000 Control Delay			65.5			HCM 2000 Level of Service				E		
HCM 2000 Volume to Capacity ratio			1.08									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)				26.0		
Intersection Capacity Utilization			102.2%			ICU Level of Service				G		
Analysis Period (min)			15									
c Critical Lane Group												

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	262	1048	49	587
v/c Ratio	0.77	0.42	0.15	0.24
Control Delay	57.5	8.5	6.7	6.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	57.5	8.5	6.7	6.2
Queue Length 50th (ft)	181	156	10	63
Queue Length 95th (ft)	222	220	21	78
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	589	2496	327	2474
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.44	0.42	0.15	0.24
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	150	62	777	103	46	546
Future Volume (vph)	150	62	777	103	46	546
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.98		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1752		3530		1805	3505
Flt Permitted	0.97		1.00		0.24	1.00
Satd. Flow (perm)	1752		3530		463	3505
Peak-hour factor, PHF	0.81	0.81	0.84	0.84	0.93	0.93
Adj. Flow (vph)	185	77	925	123	49	587
RTOR Reduction (vph)	15	0	6	0	0	0
Lane Group Flow (vph)	247	0	1042	0	49	587
Heavy Vehicles (%)	0%	2%	0%	4%	0%	3%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	22.3		84.7		84.7	84.7
Effective Green, g (s)	22.3		84.7		84.7	84.7
Actuated g/C Ratio	0.19		0.71		0.71	0.71
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	325		2491		326	2473
v/s Ratio Prot	c0.14		c0.30			0.17
v/s Ratio Perm					0.11	
v/c Ratio	0.76		0.42		0.15	0.24
Uniform Delay, d1	46.3		7.4		5.8	6.2
Progression Factor	1.00		1.00		0.74	0.86
Incremental Delay, d2	9.7		0.5		0.9	0.2
Delay (s)	56.0		7.9		5.3	5.6
Level of Service	E		A		A	A
Approach Delay (s)	56.0		7.9			5.6
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	62	928	578	127	259	71
v/c Ratio	0.15	0.48	0.36	0.09	0.40	0.11
Control Delay	18.6	26.6	13.8	0.1	30.7	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	26.6	13.8	0.1	30.7	6.2
Queue Length 50th (ft)	30	306	60	0	148	0
Queue Length 95th (ft)	58	357	77	1	190	23
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	458	1950	1608	1428	654	630
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.48	0.36	0.09	0.40	0.11
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↱↱	↱↱	↰	↰	↰
Traffic Volume (vph)	53	789	532	117	205	56
Future Volume (vph)	53	789	532	117	205	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1615	1805	1615
Flt Permitted	0.33	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	634	3574	3574	1615	1805	1615
Peak-hour factor, PHF	0.85	0.85	0.92	0.92	0.79	0.79
Adj. Flow (vph)	62	928	578	127	259	71
RTOR Reduction (vph)	0	0	0	25	0	45
Lane Group Flow (vph)	62	928	578	102	259	26
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	65.5	65.5	52.7	96.2	43.5	43.5
Effective Green, g (s)	65.5	65.5	52.7	96.2	43.5	43.5
Actuated g/C Ratio	0.55	0.55	0.44	0.80	0.36	0.36
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	407	1950	1569	1294	654	585
v/s Ratio Prot	0.01	c0.26	0.16	0.03	c0.14	
v/s Ratio Perm	0.07			0.03		0.02
v/c Ratio	0.15	0.48	0.37	0.08	0.40	0.04
Uniform Delay, d1	13.7	16.7	22.5	2.5	28.5	24.8
Progression Factor	1.38	1.53	0.58	0.01	1.00	1.00
Incremental Delay, d2	0.2	0.8	0.6	0.1	1.8	0.1
Delay (s)	19.0	26.3	13.7	0.1	30.3	24.9
Level of Service	B	C	B	A	C	C
Approach Delay (s)		25.8	11.3		29.1	
Approach LOS		C	B		C	

Intersection Summary

HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	63	1024	684	410	569	36
v/c Ratio	0.15	0.53	0.44	0.30	0.47	0.06
Control Delay	7.7	8.6	25.3	0.8	32.3	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.7	8.6	25.3	0.8	32.3	8.6
Queue Length 50th (ft)	11	126	199	0	176	0
Queue Length 95th (ft)	24	168	254	15	229	23
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	426	1950	1569	1381	1199	565
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.53	0.44	0.30	0.47	0.06
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	58	942	622	373	535	34
Future Volume (vph)	58	942	622	373	535	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1553	3467	1568
Flt Permitted	0.32	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	607	3574	3574	1553	3467	1568
Peak-hour factor, PHF	0.92	0.92	0.91	0.91	0.94	0.94
Adj. Flow (vph)	63	1024	684	410	569	36
RTOR Reduction (vph)	0	0	0	93	0	24
Lane Group Flow (vph)	63	1024	684	317	569	12
Heavy Vehicles (%)	0%	1%	1%	4%	1%	3%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	65.5	65.5	51.4	92.9	41.5	41.5
Effective Green, g (s)	65.5	65.5	51.4	92.9	41.5	41.5
Actuated g/C Ratio	0.55	0.55	0.43	0.77	0.35	0.35
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	407	1950	1530	1286	1199	542
v/s Ratio Prot	0.01	c0.29	0.19	0.09	c0.16	
v/s Ratio Perm	0.07			0.12		0.01
v/c Ratio	0.15	0.53	0.45	0.25	0.47	0.02
Uniform Delay, d1	19.3	17.3	24.3	3.8	30.7	25.9
Progression Factor	0.49	0.44	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.9	0.9	0.5	1.3	0.1
Delay (s)	9.5	8.5	25.2	4.2	32.1	26.0
Level of Service	A	A	C	A	C	C
Approach Delay (s)		8.5	17.3		31.7	
Approach LOS		A	B		C	

Intersection Summary

HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Concord Rd & Site Access

10/27/2020



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	2	40	107	97	19	467	12	525	3
v/c Ratio	0.01	0.18	0.63	0.35	0.03	0.17	0.02	0.35	0.00
Control Delay	43.0	14.8	65.9	12.3	3.2	3.0	3.2	4.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Total Delay	43.0	14.8	65.9	12.3	3.2	3.0	3.2	4.8	0.0
Queue Length 50th (ft)	1	0	80	0	2	32	1	88	0
Queue Length 95th (ft)	7	21	116	34	9	59	7	164	0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	440	440	362	478	680	2791	741	1515	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	572	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.09	0.30	0.20	0.03	0.17	0.02	0.56	0.00
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↗	↘		↗	↘	↗	↘	↗	↘	↗	↘
Traffic Volume (vph)	1	1	29	74	10	77	17	385	35	11	483	3
Future Volume (vph)	1	1	29	74	10	77	17	385	35	11	483	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1854	1615		1820	1599	1805	3461		1805	1881	1615
Flt Permitted		0.91	1.00		0.75	1.00	0.44	1.00		0.48	1.00	1.00
Satd. Flow (perm)		1734	1615		1426	1599	845	3461		919	1881	1615
Peak-hour factor, PHF	0.73	0.73	0.73	0.79	0.79	0.79	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	1	1	40	94	13	97	19	428	39	12	525	3
RTOR Reduction (vph)	0	0	35	0	0	85	0	3	0	0	0	0
Lane Group Flow (vph)	0	2	5	0	107	12	19	464	0	12	525	3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	3%	3%	0%	1%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		14.3	14.3		14.3	14.3	96.7	96.7		96.7	96.7	111.0
Effective Green, g (s)		14.3	14.3		14.3	14.3	96.7	96.7		96.7	96.7	111.0
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.81	0.81		0.81	0.81	0.92
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		206	192		169	190	680	2788		740	1515	1615
v/s Ratio Prot								0.13			c0.28	0.00
v/s Ratio Perm		0.00	0.00		c0.08	0.01	0.02			0.01		0.00
v/c Ratio		0.01	0.02		0.63	0.06	0.03	0.17		0.02	0.35	0.00
Uniform Delay, d1		46.6	46.7		50.4	46.9	2.3	2.6		2.3	3.1	0.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		7.5	0.1	0.1	0.1		0.0	0.6	0.0
Delay (s)		46.6	46.7		57.9	47.0	2.4	2.7		2.3	3.8	0.3
Level of Service		D	D		E	D	A	A		A	A	A
Approach Delay (s)		46.7			52.7			2.7			3.7	
Approach LOS		D			D			A			A	

Intersection Summary

HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020













Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	39	1140	34	1592	53	130
v/c Ratio	0.24	0.47	0.10	0.66	0.22	0.43
Control Delay	11.0	10.2	9.1	13.9	28.5	24.0
Queue Delay	0.0	0.7	0.0	0.3	0.0	0.0
Total Delay	11.0	10.9	9.1	14.2	28.5	24.0
Queue Length 50th (ft)	10	224	9	397	18	33
Queue Length 95th (ft)	23	273	21	478	46	37
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	160	2419	355	2395	243	299
Starvation Cap Reductn	0	836	0	276	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.72	0.10	0.75	0.22	0.43

Intersection Summary

HCM Signalized Intersection Capacity Analysis

18: Kingston Pike & Lendon Welsch Way

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1048	12	32	1465	31	18	2	21	17	6	53
Future Volume (vph)	36	1048	12	32	1465	31	18	2	21	17	6	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.93			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1570	3532		1805	3520			1732			1624	
Flt Permitted	0.08	1.00		0.24	1.00			0.82			0.91	
Satd. Flow (perm)	139	3532		449	3520			1446			1502	
Peak-hour factor, PHF	0.93	0.93	0.90	0.94	0.94	0.94	0.78	0.78	0.78	0.58	0.58	0.58
Adj. Flow (vph)	39	1127	13	34	1559	33	23	3	27	29	10	91
RTOR Reduction (vph)	0	1	0	0	1	0	0	23	0	0	69	0
Lane Group Flow (vph)	39	1139	0	34	1591	0	0	30	0	0	61	0
Heavy Vehicles (%)	15%	2%	6%	0%	2%	14%	0%	0%	0%	12%	0%	3%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	80.3	80.3		79.7	79.7			18.5			18.5	
Effective Green, g (s)	80.3	80.3		79.7	79.7			18.5			18.5	
Actuated g/C Ratio	0.66	0.66		0.66	0.66			0.15			0.15	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	131	2343		326	2318			221			229	
v/s Ratio Prot	0.01	c0.32		0.00	c0.45							
v/s Ratio Perm	0.19			0.07				0.02			c0.04	
v/c Ratio	0.30	0.49		0.10	0.69			0.14			0.26	
Uniform Delay, d1	13.3	10.1		9.2	12.9			44.3			45.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.3	0.7		0.1	1.7			1.3			0.6	
Delay (s)	14.6	10.8		9.3	14.5			45.6			45.9	
Level of Service	B	B		A	B			D			D	
Approach Delay (s)		11.0			14.4			45.6			45.9	
Approach LOS		B			B			D			D	
Intersection Summary												
HCM 2000 Control Delay			15.0			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			121.0			Sum of lost time (s)			19.5			
Intersection Capacity Utilization			57.2%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020




















Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	3	992	67	199	1442	112	113	215	16
v/c Ratio	0.02	0.50	0.06	0.56	0.61	0.61	0.62	0.45	0.17
Control Delay	13.3	21.5	0.1	28.3	17.4	69.1	69.5	6.2	47.8
Queue Delay	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0
Total Delay	13.3	21.5	0.1	28.3	19.7	69.1	69.5	6.2	47.8
Queue Length 50th (ft)	1	243	0	51	291	96	97	0	8
Queue Length 95th (ft)	6	428	0	124	660	137	138	26	24
Internal Link Dist (ft)		937			449		417		100
Turn Bay Length (ft)	125		100	125		200		200	
Base Capacity (vph)	154	1985	1046	389	2367	310	310	488	189
Starvation Cap Reductn	0	0	0	0	752	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.50	0.06	0.51	0.89	0.36	0.36	0.44	0.08

Intersection Summary

HCM Signalized Intersection Capacity Analysis





22: Brooklawn St & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	913	62	187	1353	3	180	0	172	4	3	4
Future Volume (vph)	3	913	62	187	1353	3	180	0	172	4	3	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (prot)	1805	3539	1615	1787	3573		1715	1715	1615		1771	
Flt Permitted	0.09	1.00	1.00	0.20	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (perm)	164	3539	1615	377	3573		1715	1715	1615		1771	
Peak-hour factor, PHF	0.92	0.92	0.92	0.94	0.94	0.94	0.80	0.80	0.80	0.69	0.69	0.69
Adj. Flow (vph)	3	992	67	199	1439	3	225	0	215	6	4	6
RTOR Reduction (vph)	0	0	33	0	0	0	0	0	169	0	6	0
Lane Group Flow (vph)	3	992	34	199	1442	0	112	113	46	0	10	0
Heavy Vehicles (%)	0%	2%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)	63.4	62.5	66.5	83.1	75.7		13.9	13.9	28.0		3.0	
Effective Green, g (s)	63.4	62.5	66.5	83.1	75.7		13.9	13.9	28.0		3.0	
Actuated g/C Ratio	0.49	0.48	0.51	0.64	0.58		0.11	0.11	0.22		0.02	
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	91	1701	826	393	2080		183	183	347		40	
v/s Ratio Prot	0.00	0.28	c0.00	c0.05	c0.40		0.07	c0.07	0.01		c0.01	
v/s Ratio Perm	0.02		0.02	0.27					0.01			
v/c Ratio	0.03	0.58	0.04	0.51	0.69		0.61	0.62	0.13		0.25	
Uniform Delay, d1	38.6	24.4	15.8	28.0	19.0		55.5	55.5	41.2		62.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.1	1.5	0.0	1.0	1.9		5.9	6.1	0.2		3.3	
Delay (s)	38.7	25.8	15.9	29.1	20.9		61.4	61.6	41.4		65.7	
Level of Service	D	C	B	C	C		E	E	D		E	
Approach Delay (s)		25.2			21.9			51.7			65.7	
Approach LOS		C			C			D			E	
Intersection Summary												
HCM 2000 Control Delay			27.4			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			69.1%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Int Delay, s/veh 3.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	78	87	112	193	9
Future Vol, veh/h	4	78	87	112	193	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	75	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	85	95	122	210	10







Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	527	215	220
Stage 1	215	-	-
Stage 2	312	-	-
Critical Hdwy	6.42	6.22	4.12
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.318	2.218
Pot Cap-1 Maneuver	512	825	1349
Stage 1	821	-	-
Stage 2	742	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	476	825	1349
Mov Cap-2 Maneuver	476	-	-
Stage 1	764	-	-
Stage 2	742	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	3.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT EBLn1	SBT	SBR
Capacity (veh/h)	1349	- 797	-	-
HCM Lane V/C Ratio	0.07	- 0.112	-	-
HCM Control Delay (s)	7.9	- 10.1	-	-
HCM Lane LOS	A	- B	-	-
HCM 95th %tile Q(veh)	0.2	- 0.4	-	-

Intersection

Int Delay, s/veh 7.6

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	24	122	69	18	90	20	175	10	26	44	20	31
Future Vol, veh/h	24	122	69	18	90	20	175	10	26	44	20	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	133	75	20	98	22	190	11	28	48	22	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	120	0	0	208	0	0	400	383	171	391	409	109
Stage 1	-	-	-	-	-	-	223	223	-	149	149	-
Stage 2	-	-	-	-	-	-	177	160	-	242	260	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1468	-	-	1363	-	-	560	550	873	568	532	945
Stage 1	-	-	-	-	-	-	780	719	-	854	774	-
Stage 2	-	-	-	-	-	-	825	766	-	762	693	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1468	-	-	1363	-	-	510	532	873	528	514	945
Mov Cap-2 Maneuver	-	-	-	-	-	-	510	532	-	528	514	-
Stage 1	-	-	-	-	-	-	766	706	-	839	762	-
Stage 2	-	-	-	-	-	-	762	755	-	713	681	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.8	1.1	16.5	12.1
HCM LOS			C	B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	539	1363	-	-	1468	-	613
HCM Lane V/C Ratio	0.426	0.014	-	-	0.018	-	0.168
HCM Control Delay (s)	16.5	7.7	-	-	7.5	-	12.1
HCM Lane LOS	C	A	-	-	A	-	B
HCM 95th %tile Q(veh)	2.1	0	-	-	0.1	-	0.6

HCM 6th Roundabout
26: Brooklawn St & Kroger Roundabout

10/27/2020

Intersection			
Intersection Delay, s/veh	3.8		
Intersection LOS	A		
Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	89	128	208
Demand Flow Rate, veh/h	91	130	212
Vehicles Circulating, veh/h	163	33	23
Vehicles Exiting, veh/h	72	221	140
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	3.8	3.5	4.0
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	91	130	212
Cap Entry Lane, veh/h	1169	1334	1348
Entry HV Adj Factor	0.978	0.984	0.980
Flow Entry, veh/h	89	128	208
Cap Entry, veh/h	1143	1313	1321
V/C Ratio	0.078	0.097	0.157
Control Delay, s/veh	3.8	3.5	4.0
LOS	A	A	A
95th %tile Queue, veh	0	0	1

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	214	1327	163	889	240	311	636	385	304
v/c Ratio	0.60	1.05	0.44	0.58	0.79	1.08	1.06	1.02	0.91
Control Delay	15.7	60.7	26.2	27.9	77.3	126.5	80.8	111.0	75.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.7	60.7	26.2	27.9	77.3	126.5	80.8	111.0	75.3
Queue Length 50th (ft)	31	~651	75	283	109	~306	~409	~184	218
Queue Length 95th (ft)	m57	#795	147	364	#189	#498	#686	#289	#379
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	396	1264	371	1542	304	288	598	376	353
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	1.05	0.44	0.58	0.79	1.08	1.06	1.02	0.86

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	197	1150	71	150	608	210	221	286	585	354	105	175
Future Volume (vph)	197	1150	71	150	608	210	221	286	585	354	105	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	0.96		1.00	1.00	0.85	1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3512		1687	3338		3433	1900	1599	3502	1705	
Flt Permitted	0.28	1.00		0.07	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	527	3512		129	3338		3433	1900	1599	3502	1705	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	1250	77	163	661	228	240	311	636	385	114	190
RTOR Reduction (vph)	0	3	0	0	25	0	0	0	53	0	45	0
Lane Group Flow (vph)	214	1324	0	163	864	0	240	311	583	385	259	0
Heavy Vehicles (%)	0%	2%	0%	7%	5%	1%	2%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6					8			
Actuated Green, G (s)	61.1	48.5		80.5	61.4		12.0	20.5	46.0	14.5	23.0	
Effective Green, g (s)	61.1	48.5		80.5	61.4		12.0	20.5	46.0	14.5	23.0	
Actuated g/C Ratio	0.45	0.36		0.60	0.45		0.09	0.15	0.34	0.11	0.17	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	357	1261		371	1518		305	288	544	376	290	
v/s Ratio Prot	0.06	c0.38		0.08	0.26		0.07	c0.16	c0.20	c0.11	0.15	
v/s Ratio Perm	0.21			0.18					0.16			
v/c Ratio	0.60	1.05		0.44	0.57		0.79	1.08	1.07	1.02	0.89	
Uniform Delay, d1	23.2	43.2		27.9	27.1		60.2	57.2	44.5	60.2	54.8	
Progression Factor	0.70	0.55		1.00	1.00		0.99	0.99	0.96	1.00	1.00	
Incremental Delay, d2	1.9	35.8		0.8	1.6		11.9	74.3	57.8	52.7	27.4	
Delay (s)	18.1	59.5		28.7	28.6		71.3	130.7	100.5	112.9	82.2	
Level of Service	B	E		C	C		E	F	F	F	F	
Approach Delay (s)		53.7			28.6			102.5			99.3	
Approach LOS		D			C			F			F	
Intersection Summary												
HCM 2000 Control Delay			67.8			HCM 2000 Level of Service			E			
HCM 2000 Volume to Capacity ratio			1.06									
Actuated Cycle Length (s)			135.0			Sum of lost time (s)			26.0			
Intersection Capacity Utilization			96.6%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	542	1543	177	48	672	224	325	509	324	282	439
v/c Ratio	0.98	0.87	0.21	0.42	0.85	0.31	0.86	0.99	1.01	0.57	0.54
Control Delay	71.9	37.8	4.0	53.8	49.1	5.2	36.0	64.2	93.1	58.7	19.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.9	37.8	4.0	53.8	49.1	5.2	36.0	64.2	93.1	58.7	19.4
Queue Length 50th (ft)	424	640	5	19	251	2	54	238	~241	123	184
Queue Length 95th (ft)	#668	755	45	46	#342	0	#293	#357	#442	172	286
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	551	1765	837	114	792	727	384	513	320	498	814
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.87	0.21	0.42	0.85	0.31	0.85	0.99	1.01	0.57	0.54

























Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	499	1420	163	44	618	206	299	434	34	298	259	404
Future Volume (vph)	499	1420	163	44	618	206	299	434	34	298	259	404
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3574	1524	1805	3505	1599	1719	3528		1752	3406	1553
Flt Permitted	0.15	1.00	1.00	0.15	1.00	1.00	0.47	1.00		0.20	1.00	1.00
Satd. Flow (perm)	272	3574	1524	283	3505	1599	856	3528		373	3406	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	542	1543	177	48	672	224	325	472	37	324	282	439
RTOR Reduction (vph)	0	0	86	0	0	50	0	4	0	0	0	76
Lane Group Flow (vph)	542	1543	91	48	672	174	325	505	0	324	282	363
Heavy Vehicles (%)	4%	1%	6%	0%	3%	1%	5%	1%	4%	3%	6%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	65.4	65.4	65.4	30.5	30.5	51.0	39.7	19.5		40.3	19.8	58.3
Effective Green, g (s)	65.4	65.4	65.4	30.5	30.5	51.0	39.7	19.5		40.3	19.8	58.3
Actuated g/C Ratio	0.48	0.48	0.48	0.23	0.23	0.38	0.29	0.14		0.30	0.15	0.43
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	549	1731	738	104	791	681	380	509		320	499	745
v/s Ratio Prot	c0.28	0.43		0.01	c0.19	0.04	0.13	0.14		c0.15	0.08	0.14
v/s Ratio Perm	c0.20		0.06	0.09		0.07	0.12			c0.15		0.09
v/c Ratio	0.99	0.89	0.12	0.46	0.85	0.25	0.86	0.99		1.01	0.57	0.49
Uniform Delay, d1	38.9	31.6	19.1	51.9	50.1	28.9	41.9	57.7		42.0	53.6	27.6
Progression Factor	1.00	1.00	1.00	0.83	0.76	0.26	0.37	0.42		1.00	1.00	1.00
Incremental Delay, d2	34.8	7.4	0.3	3.1	10.7	0.2	16.6	37.4		53.5	4.6	0.5
Delay (s)	73.7	39.0	19.4	46.1	48.8	7.6	32.0	61.8		95.5	58.2	28.1
Level of Service	E	D	B	D	D	A	C	E		F	E	C
Approach Delay (s)		45.8			38.9			50.2			57.1	
Approach LOS		D			D			D			E	
Intersection Summary												
HCM 2000 Control Delay			47.6									
HCM 2000 Volume to Capacity ratio			0.98									
Actuated Cycle Length (s)			135.0									
Intersection Capacity Utilization			96.0%									
Analysis Period (min)			15									
c Critical Lane Group												

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	118	459	45	752
v/c Ratio	0.63	0.17	0.06	0.27
Control Delay	64.6	1.3	0.4	0.6
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	64.6	1.3	0.4	0.6
Queue Length 50th (ft)	87	15	0	3
Queue Length 95th (ft)	147	24	1	4
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	500	2734	746	2795
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.24	0.17	0.06	0.27
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	75	33	333	89	41	692
Future Volume (vph)	75	33	333	89	41	692
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1761		3385		1805	3471
Flt Permitted	0.97		1.00		0.49	1.00
Satd. Flow (perm)	1761		3385		927	3471
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	36	362	97	45	752
RTOR Reduction (vph)	14	0	9	0	0	0
Lane Group Flow (vph)	104	0	450	0	45	752
Heavy Vehicles (%)	0%	0%	2%	8%	0%	4%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	13.3		108.7		108.7	108.7
Effective Green, g (s)	13.3		108.7		108.7	108.7
Actuated g/C Ratio	0.10		0.81		0.81	0.81
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	173		2725		746	2794
v/s Ratio Prot	c0.06		0.13			c0.22
v/s Ratio Perm					0.05	
v/c Ratio	0.60		0.17		0.06	0.27
Uniform Delay, d1	58.3		3.0		2.7	3.3
Progression Factor	1.00		0.41		0.07	0.10
Incremental Delay, d2	5.5		0.1		0.1	0.2
Delay (s)	63.8		1.3		0.3	0.6
Level of Service	E		A		A	A
Approach Delay (s)	63.8		1.3			0.6
Approach LOS	E		A			A
Intersection Summary						
HCM 2000 Control Delay			6.2		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.30			
Actuated Cycle Length (s)			135.0		Sum of lost time (s)	13.0
Intersection Capacity Utilization			38.6%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	14	365	825	122	42	9
v/c Ratio	0.03	0.15	0.34	0.08	0.12	0.03
Control Delay	2.4	2.3	1.0	0.1	45.8	22.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.4	2.3	1.0	0.1	45.8	22.1
Queue Length 50th (ft)	1	15	4	0	31	0
Queue Length 95th (ft)	3	20	13	m0	65	16
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	492	2459	2400	1539	354	324
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.15	0.34	0.08	0.12	0.03

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↱↱	↱↱	↰	↰	↰
Traffic Volume (vph)	13	336	759	112	39	8
Future Volume (vph)	13	336	759	112	39	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3406	3505	1615	1805	1615
Flt Permitted	0.29	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	547	3406	3505	1615	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	365	825	122	42	9
RTOR Reduction (vph)	0	0	0	18	0	7
Lane Group Flow (vph)	14	365	825	104	42	2
Heavy Vehicles (%)	0%	6%	3%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	97.5	97.5	88.5	115.0	26.5	26.5
Effective Green, g (s)	97.5	97.5	88.5	115.0	26.5	26.5
Actuated g/C Ratio	0.72	0.72	0.66	0.85	0.20	0.20
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	418	2459	2297	1375	354	317
v/s Ratio Prot	0.00	c0.11	c0.24	0.01	c0.02	
v/s Ratio Perm	0.02			0.05		0.00
v/c Ratio	0.03	0.15	0.36	0.08	0.12	0.01
Uniform Delay, d1	6.1	5.8	10.5	1.6	44.6	43.6
Progression Factor	0.42	0.37	0.08	0.00	1.00	1.00
Incremental Delay, d2	0.0	0.1	0.3	0.1	0.7	0.0
Delay (s)	2.6	2.3	1.1	0.1	45.3	43.7
Level of Service	A	A	A	A	D	D
Approach Delay (s)		2.3	1.0		45.0	
Approach LOS		A	A		D	

Intersection Summary

HCM 2000 Control Delay	3.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	34.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	26	400	942	1200	273	51
v/c Ratio	0.16	0.26	0.72	0.78	0.16	0.06
Control Delay	15.9	13.2	41.3	5.1	19.7	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.9	13.2	41.3	5.1	19.7	4.9
Queue Length 50th (ft)	8	64	392	47	67	0
Queue Length 95th (ft)	20	85	476	91	94	23
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	158	1510	1308	1534	1699	809
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.26	0.72	0.78	0.16	0.06
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	24	368	867	1104	251	47
Future Volume (vph)	24	368	867	1104	251	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1671	3610	3539	1599	3502	1615
Flt Permitted	0.15	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	268	3610	3539	1599	3502	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	400	942	1200	273	51
RTOR Reduction (vph)	0	0	0	126	0	26
Lane Group Flow (vph)	26	400	942	1074	273	25
Heavy Vehicles (%)	8%	0%	2%	1%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	56.5	56.5	47.3	112.8	65.5	65.5
Effective Green, g (s)	56.5	56.5	47.3	112.8	65.5	65.5
Actuated g/C Ratio	0.42	0.42	0.35	0.84	0.49	0.49
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	140	1510	1239	1413	1699	783
v/s Ratio Prot	0.00	c0.11	0.27	c0.37	0.08	
v/s Ratio Perm	0.07			0.30		0.02
v/c Ratio	0.19	0.26	0.76	0.76	0.16	0.03
Uniform Delay, d1	43.2	25.7	38.8	5.0	19.4	18.2
Progression Factor	0.50	0.50	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.4	4.4	3.9	0.2	0.1
Delay (s)	22.2	13.1	43.3	8.9	19.6	18.2
Level of Service	C	B	D	A	B	B
Approach Delay (s)		13.7	24.0		19.4	
Approach LOS		B	C		B	

Intersection Summary

HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Concord Rd & Site Access

10/27/2020



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	1	14	9	14	46	1291	11	352	2
v/c Ratio	0.01	0.16	0.12	0.16	0.05	0.39	0.03	0.20	0.00
Control Delay	61.0	30.2	64.4	30.2	1.0	1.4	1.4	1.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.0	30.2	64.4	30.2	1.0	1.4	1.4	1.1	0.0
Queue Length 50th (ft)	1	0	8	0	3	67	1	26	0
Queue Length 95th (ft)	7	23	27	23	8	93	m2	m44	m0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	288	257	250	257	971	3301	367	1748	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	3	0	1	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.05	0.04	0.06	0.05	0.39	0.03	0.20	0.00


Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘		↗	↘	↘	↗↘		↘	↗	↘
Traffic Volume (vph)	0	1	13	6	2	13	42	1130	58	10	324	2
Future Volume (vph)	0	1	13	6	2	13	42	1130	58	10	324	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		1.00	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1900	1615		1829	1615	1805	3550		1805	1881	1615
Flt Permitted		1.00	1.00		0.87	1.00	0.55	1.00		0.21	1.00	1.00
Satd. Flow (perm)		1900	1615		1648	1615	1045	3550		395	1881	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1	14	7	2	14	46	1228	63	11	352	2
RTOR Reduction (vph)	0	0	14	0	0	14	0	1	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	9	0	46	1290	0	11	352	2
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type		NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		4.1	4.1		4.1	4.1	121.9	121.9		121.9	121.9	126.0
Effective Green, g (s)		4.1	4.1		4.1	4.1	121.9	121.9		121.9	121.9	126.0
Actuated g/C Ratio		0.03	0.03		0.03	0.03	0.90	0.90		0.90	0.90	0.93
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		57	49		50	49	943	3205		356	1698	1615
v/s Ratio Prot		0.00						c0.36			0.19	0.00
v/s Ratio Perm			0.00		c0.01	0.00	0.04			0.03		0.00
v/c Ratio		0.02	0.01		0.18	0.01	0.05	0.40		0.03	0.21	0.00
Uniform Delay, d1		63.5	63.5		63.8	63.5	0.7	1.0		0.7	0.8	0.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.27	1.11	1.00
Incremental Delay, d2		0.1	0.1		1.7	0.1	0.1	0.4		0.1	0.2	0.0
Delay (s)		63.6	63.5		65.5	63.5	0.8	1.4		0.9	1.1	0.3
Level of Service		E	E		E	E	A	A		A	A	A
Approach Delay (s)		63.6			64.3			1.4			1.1	
Approach LOS		E			E			A			A	

Intersection Summary

HCM 2000 Control Delay	2.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	310	1574	15	1139	99	245
v/c Ratio	0.82	0.69	0.09	0.73	0.22	0.71
Control Delay	51.8	7.0	9.9	22.5	42.2	54.3
Queue Delay	0.0	0.3	0.0	0.0	0.0	0.0
Total Delay	51.8	7.3	9.9	22.5	42.2	54.3
Queue Length 50th (ft)	166	47	3	281	69	176
Queue Length 95th (ft)	257	296	m6	322	121	277
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	440	2279	159	1568	441	344
Starvation Cap Reductn	0	200	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.76	0.09	0.73	0.22	0.71

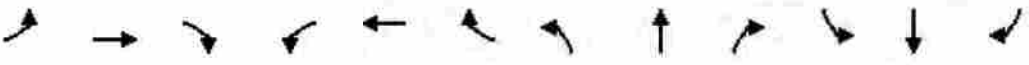
Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

18: Kingston Pike & Lendon Welsch Way

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↶↷		↰	↶↷			↕			↕	
Traffic Volume (vph)	285	1444	4	14	840	208	0	85	6	111	9	105
Future Volume (vph)	285	1444	4	14	840	208	0	85	6	111	9	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	0.97			0.99			0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1687	3573		1805	3374			1882			1698	
Flt Permitted	0.12	1.00		0.11	1.00			1.00			0.79	
Satd. Flow (perm)	209	3573		215	3374			1882			1380	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	1570	4	15	913	226	0	92	7	121	10	114
RTOR Reduction (vph)	0	0	0	0	15	0	0	2	0	0	23	0
Lane Group Flow (vph)	310	1574	0	15	1124	0	0	97	0	0	222	0
Heavy Vehicles (%)	7%	1%	0%	0%	4%	3%	0%	0%	0%	1%	0%	4%
Turn Type	pm+pt	NA		pm+pt	NA			NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	90.5	82.2		64.0	62.2			31.5			31.5	
Effective Green, g (s)	90.5	82.2		64.0	62.2			31.5			31.5	
Actuated g/C Ratio	0.67	0.61		0.47	0.46			0.23			0.23	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	378	2175		123	1554			439			322	
v/s Ratio Prot	c0.13	0.44		0.00	0.33			0.05				
v/s Ratio Perm	c0.42			0.06							c0.16	
v/c Ratio	0.82	0.72		0.12	0.72			0.22			0.69	
Uniform Delay, d1	30.4	18.5		20.2	29.4			41.8			47.3	
Progression Factor	1.56	0.34		0.82	0.67			1.00			1.00	
Incremental Delay, d2	10.2	1.6		0.3	2.3			1.2			6.0	
Delay (s)	57.7	7.8		16.8	22.0			43.0			53.3	
Level of Service	E	A		B	C			D			D	
Approach Delay (s)		16.0			22.0			43.0			53.3	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			21.5			HCM 2000 Level of Service					C	
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			135.0			Sum of lost time (s)			19.5			
Intersection Capacity Utilization			81.6%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	1757	27	112	904	29	29	154
v/c Ratio	0.68	0.02	0.60	0.31	0.30	0.30	0.49
Control Delay	4.3	0.0	26.1	1.5	67.8	67.8	8.1
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	4.3	0.0	26.1	1.6	67.8	67.8	8.1
Queue Length 50th (ft)	151	0	26	44	26	26	0
Queue Length 95th (ft)	m206	m0	m61	47	61	61	33
Internal Link Dist (ft)	937			449		417	
Turn Bay Length (ft)		100	125		200		200
Base Capacity (vph)	2595	1259	188	2884	235	235	317
Starvation Cap Reductn	0	0	0	681	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.02	0.60	0.41	0.12	0.12	0.49






















Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

22: Brooklawn St & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1616	25	103	828	4	53	0	142	0	0	0
Future Volume (vph)	0	1616	25	103	828	4	53	0	142	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5			
Lane Util. Factor		0.95	1.00	1.00	0.95		0.95	0.95	1.00			
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85			
Flt Protected		1.00	1.00	0.95	1.00		0.95	0.95	1.00			
Satd. Flow (prot)		3539	1615	1805	3499		1715	1715	1599			
Flt Permitted		1.00	1.00	0.09	1.00		0.95	0.95	1.00			
Satd. Flow (perm)		3539	1615	164	3499		1715	1715	1599			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1757	27	112	900	4	58	0	154	0	0	0
RTOR Reduction (vph)	0	0	7	0	0	0	0	0	141	0	0	0
Lane Group Flow (vph)	0	1757	20	112	904	0	29	29	13	0	0	0
Heavy Vehicles (%)	0%	2%	0%	0%	3%	25%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov			
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)		95.1	97.8	106.1	106.1		6.7	6.7	11.2			
Effective Green, g (s)		95.1	97.8	106.1	106.1		6.7	6.7	11.2			
Actuated g/C Ratio		0.70	0.72	0.79	0.79		0.05	0.05	0.08			
Clearance Time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5			
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		2493	1169	183	2749		85	85	132			
v/s Ratio Prot		c0.50	c0.00	c0.02	0.26		c0.02	0.02	0.00			
v/s Ratio Perm			0.01	0.46					0.00			
v/c Ratio		0.70	0.02	0.61	0.33		0.34	0.34	0.10			
Uniform Delay, d1		11.7	5.2	27.7	4.2		62.0	62.0	57.2			
Progression Factor		0.32	1.00	0.90	0.32		1.00	1.00	1.00			
Incremental Delay, d2		0.7	0.0	4.0	0.2		2.4	2.4	0.3			
Delay (s)		4.5	5.2	29.0	1.5		64.4	64.4	57.5			
Level of Service		A	A	C	A		E	E	E			
Approach Delay (s)		4.5			4.6			59.4			0.0	
Approach LOS		A			A			E			A	
Intersection Summary												
HCM 2000 Control Delay			8.4			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			135.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			70.8%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	214	1327	163	889	240	311	636	385	304
v/c Ratio	0.68	0.93	0.84	0.68	0.59	0.93	0.81	0.90	0.85
Control Delay	25.9	30.1	61.5	32.5	56.4	80.8	27.9	77.3	59.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.9	30.1	61.5	32.5	56.4	80.8	27.9	77.3	59.0
Queue Length 50th (ft)	53	371	78	287	93	240	151	154	182
Queue Length 95th (ft)	m101	#650	#203	366	#160	#411	206	#244	#286
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	338	1425	194	1312	406	340	789	426	411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.93	0.84	0.68	0.59	0.91	0.81	0.90	0.74

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.


Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱	↰	↱	↰	↱
Traffic Volume (vph)	197	1150	71	150	608	210	221	286	585	354	105	175
Future Volume (vph)	197	1150	71	150	608	210	221	286	585	354	105	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	0.88	0.97	1.00	
Frt	1.00	0.99		1.00	0.96		1.00	1.00	0.85	1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3512		1687	3338		3433	1900	2814	3502	1705	
Flt Permitted	0.18	1.00		0.09	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	335	3512		154	3338		3433	1900	2814	3502	1705	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	1250	77	163	661	228	240	311	636	385	114	190
RTOR Reduction (vph)	0	4	0	0	28	0	0	0	68	0	52	0
Lane Group Flow (vph)	214	1323	0	163	861	0	240	311	568	385	252	0
Heavy Vehicles (%)	0%	2%	0%	7%	5%	1%	2%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6					8			
Actuated Green, G (s)	60.6	48.6		55.8	46.2		14.2	21.2	30.8	14.6	21.6	
Effective Green, g (s)	60.6	48.6		55.8	46.2		14.2	21.2	30.8	14.6	21.6	
Actuated g/C Ratio	0.51	0.41		0.46	0.39		0.12	0.18	0.26	0.12	0.18	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	316	1422		194	1285		406	335	722	426	306	
v/s Ratio Prot	c0.07	c0.38		0.07	0.26		0.07	c0.16	0.06	c0.11	0.15	
v/s Ratio Perm	0.27			0.32					0.14			
v/c Ratio	0.68	0.93		0.84	0.67		0.59	0.93	0.79	0.90	0.82	
Uniform Delay, d1	19.7	34.1		27.7	30.6		50.1	48.7	41.5	52.0	47.4	
Progression Factor	1.19	0.59		1.00	1.00		0.98	0.98	0.95	1.00	1.00	
Incremental Delay, d2	4.0	9.3		26.5	2.8		2.2	29.6	5.3	22.1	16.3	
Delay (s)	27.5	29.2		54.2	33.4		51.3	77.2	44.7	74.1	63.7	
Level of Service	C	C		D	C		D	E	D	E	E	
Approach Delay (s)		29.0			36.6			54.6			69.5	
Approach LOS		C			D			D			E	
Intersection Summary												
HCM 2000 Control Delay			43.8			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			26.0			
Intersection Capacity Utilization			89.2%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	542	1543	177	48	672	224	325	509	324	282	439
v/c Ratio	0.68	0.84	0.20	0.37	0.50	0.25	0.56	0.88	0.78	0.51	0.66
Control Delay	22.2	30.9	2.9	39.2	24.9	2.9	15.8	37.8	46.9	49.6	24.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	30.9	2.9	39.2	24.9	2.9	15.8	37.8	46.9	49.6	24.9
Queue Length 50th (ft)	126	541	0	18	128	0	22	166	99	106	187
Queue Length 95th (ft)	165	651	36	37	160	0	49	#282	#148	152	283
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	914	1837	869	130	1340	881	579	578	416	553	728
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.84	0.20	0.37	0.50	0.25	0.56	0.88	0.78	0.51	0.60

Intersection Summary

























95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	499	1420	163	44	618	206	299	434	34	298	259	404
Future Volume (vph)	499	1420	163	44	618	206	299	434	34	298	259	404
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3367	3574	1524	1805	3505	1599	3335	3528		3400	3406	1553
Flt Permitted	0.23	1.00	1.00	0.10	1.00	1.00	0.50	1.00		0.21	1.00	1.00
Satd. Flow (perm)	803	3574	1524	182	3505	1599	1768	3528		734	3406	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	542	1543	177	48	672	224	325	472	37	324	282	439
RTOR Reduction (vph)	0	0	88	0	0	48	0	5	0	0	0	103
Lane Group Flow (vph)	542	1543	89	48	672	176	325	504	0	324	282	336
Heavy Vehicles (%)	4%	1%	6%	0%	3%	1%	5%	1%	4%	3%	6%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	60.4	60.4	60.4	45.9	45.9	56.4	30.0	19.5		30.0	19.5	37.6
Effective Green, g (s)	60.4	60.4	60.4	45.9	45.9	56.4	30.0	19.5		30.0	19.5	37.6
Actuated g/C Ratio	0.50	0.50	0.50	0.38	0.38	0.47	0.25	0.16		0.25	0.16	0.31
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	790	1798	767	118	1340	838	579	573		416	553	570
v/s Ratio Prot	0.10	c0.43		0.01	c0.19	0.02	0.05	c0.14		c0.07	0.08	0.09
v/s Ratio Perm	0.24		0.06	0.14		0.09	0.09			0.13		0.13
v/c Ratio	0.69	0.86	0.12	0.41	0.50	0.21	0.56	0.88		0.78	0.51	0.59
Uniform Delay, d1	19.9	26.1	15.7	41.6	28.3	18.7	37.4	49.1		37.9	45.9	34.7
Progression Factor	1.00	1.00	1.00	0.82	0.80	0.22	0.36	0.40		1.00	1.00	1.00
Incremental Delay, d2	2.5	5.6	0.3	2.2	1.3	0.1	1.2	17.0		8.9	3.3	1.6
Delay (s)	22.4	31.6	16.0	36.3	24.1	4.3	14.8	36.6		46.9	49.2	36.3
Level of Service	C	C	B	D	C	A	B	D		D	D	D
Approach Delay (s)		28.2			20.0			28.1			43.0	
Approach LOS		C			B			C			D	

Intersection Summary

HCM 2000 Control Delay	29.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	118	459	45	752
v/c Ratio	0.60	0.17	0.06	0.27
Control Delay	55.6	1.6	0.5	0.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	55.6	1.6	0.5	0.9
Queue Length 50th (ft)	75	19	0	3
Queue Length 95th (ft)	132	25	1	4
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	518	2681	731	2739
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.23	0.17	0.06	0.27
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	75	33	333	89	41	692
Future Volume (vph)	75	33	333	89	41	692
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1761		3385		1805	3471
Flt Permitted	0.97		1.00		0.49	1.00
Satd. Flow (perm)	1761		3385		927	3471
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	36	362	97	45	752
RTOR Reduction (vph)	16	0	11	0	0	0
Lane Group Flow (vph)	102	0	448	0	45	752
Heavy Vehicles (%)	0%	0%	2%	8%	0%	4%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	12.3		94.7		94.7	94.7
Effective Green, g (s)	12.3		94.7		94.7	94.7
Actuated g/C Ratio	0.10		0.79		0.79	0.79
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	180		2671		731	2739
v/s Ratio Prot	c0.06		0.13			c0.22
v/s Ratio Perm					0.05	
v/c Ratio	0.57		0.17		0.06	0.27
Uniform Delay, d1	51.3		3.1		2.8	3.4
Progression Factor	1.00		0.49		0.11	0.19
Incremental Delay, d2	4.0		0.1		0.2	0.2
Delay (s)	55.3		1.6		0.5	0.9
Level of Service	E		A		A	A
Approach Delay (s)	55.3		1.6			0.9
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	5.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	14	365	825	122	42	9
v/c Ratio	0.03	0.15	0.36	0.08	0.11	0.03
Control Delay	4.9	4.5	1.3	0.1	40.0	20.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.9	4.5	1.3	0.1	40.0	20.4
Queue Length 50th (ft)	1	16	4	0	27	0
Queue Length 95th (ft)	7	42	12	m0	59	14
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	477	2398	2321	1530	368	336
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.15	0.36	0.08	0.11	0.03

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↱↱	↱↱	↰	↰	↰
Traffic Volume (vph)	13	336	759	112	39	8
Future Volume (vph)	13	336	759	112	39	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3406	3505	1615	1805	1615
Flt Permitted	0.28	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	536	3406	3505	1615	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	365	825	122	42	9
RTOR Reduction (vph)	0	0	0	20	0	7
Lane Group Flow (vph)	14	365	825	102	42	2
Heavy Vehicles (%)	0%	6%	3%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	84.5	84.5	75.6	100.1	24.5	24.5
Effective Green, g (s)	84.5	84.5	75.6	100.1	24.5	24.5
Actuated g/C Ratio	0.70	0.70	0.63	0.83	0.20	0.20
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	402	2398	2208	1347	368	329
v/s Ratio Prot	0.00	c0.11	c0.24	0.02	c0.02	
v/s Ratio Perm	0.02			0.05		0.00
v/c Ratio	0.03	0.15	0.37	0.08	0.11	0.01
Uniform Delay, d1	6.1	5.9	10.7	1.8	38.9	38.0
Progression Factor	0.90	0.75	0.10	0.00	1.00	1.00
Incremental Delay, d2	0.0	0.1	0.3	0.1	0.6	0.0
Delay (s)	5.6	4.5	1.4	0.1	39.5	38.1
Level of Service	A	A	A	A	D	D
Approach Delay (s)		4.6	1.3		39.3	
Approach LOS		A	A		D	

Intersection Summary

HCM 2000 Control Delay	3.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	34.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	26	400	942	1200	273	51
v/c Ratio	0.16	0.26	0.73	0.79	0.17	0.06
Control Delay	13.3	11.4	37.9	5.4	18.6	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.3	11.4	37.9	5.4	18.6	5.0
Queue Length 50th (ft)	5	44	349	45	60	0
Queue Length 95th (ft)	15	63	432	94	87	22
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	167	1519	1294	1528	1648	787
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.26	0.73	0.79	0.17	0.06
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	24	368	867	1104	251	47
Future Volume (vph)	24	368	867	1104	251	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1671	3610	3539	1599	3502	1615
Flt Permitted	0.15	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	272	3610	3539	1599	3502	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	400	942	1200	273	51
RTOR Reduction (vph)	0	0	0	145	0	27
Lane Group Flow (vph)	26	400	942	1055	273	24
Heavy Vehicles (%)	8%	0%	2%	1%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	50.5	50.5	41.3	97.8	56.5	56.5
Effective Green, g (s)	50.5	50.5	41.3	97.8	56.5	56.5
Actuated g/C Ratio	0.42	0.42	0.34	0.81	0.47	0.47
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	145	1519	1218	1389	1648	760
v/s Ratio Prot	0.00	c0.11	0.27	c0.36	0.08	
v/s Ratio Perm	0.07			0.30		0.01
v/c Ratio	0.18	0.26	0.77	0.76	0.17	0.03
Uniform Delay, d1	37.8	22.6	35.2	5.4	18.2	17.1
Progression Factor	0.47	0.48	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.4	4.8	3.9	0.2	0.1
Delay (s)	18.3	11.3	40.0	9.3	18.4	17.1
Level of Service	B	B	D	A	B	B
Approach Delay (s)		11.7	22.8		18.2	
Approach LOS		B	C		B	

Intersection Summary

HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Concord Rd & Site Access

10/27/2020



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	1	14	9	14	46	1291	11	352	2
v/c Ratio	0.01	0.14	0.11	0.14	0.05	0.39	0.03	0.20	0.00
Control Delay	53.0	27.3	56.4	27.3	1.1	1.5	0.2	0.2	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.0	27.3	56.4	27.3	1.1	1.5	0.2	0.2	0.0
Queue Length 50th (ft)	1	0	7	0	3	66	0	2	0
Queue Length 95th (ft)	7	22	24	22	8	93	m0	m2	m0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	324	287	281	287	962	3272	362	1732	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.05	0.03	0.05	0.05	0.39	0.03	0.20	0.00

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↖	↗		↖	↗	↖	↗		↖	↗	↗
Traffic Volume (vph)	0	1	13	6	2	13	42	1130	58	10	324	2
Future Volume (vph)	0	1	13	6	2	13	42	1130	58	10	324	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		1.00	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1900	1615		1829	1615	1805	3550		1805	1881	1615
Flt Permitted		1.00	1.00		0.87	1.00	0.55	1.00		0.21	1.00	1.00
Satd. Flow (perm)		1900	1615		1648	1615	1045	3550		394	1881	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1	14	7	2	14	46	1228	63	11	352	2
RTOR Reduction (vph)	0	0	14	0	0	14	0	1	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	9	0	46	1290	0	11	352	2
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type		NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		4.1	4.1		4.1	4.1	106.9	106.9		106.9	106.9	111.0
Effective Green, g (s)		4.1	4.1		4.1	4.1	106.9	106.9		106.9	106.9	111.0
Actuated g/C Ratio		0.03	0.03		0.03	0.03	0.89	0.89		0.89	0.89	0.92
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		64	55		56	55	930	3162		350	1675	1615
v/s Ratio Prot		0.00						c0.36			0.19	0.00
v/s Ratio Perm			0.00		c0.01	0.00	0.04			0.03		0.00
v/c Ratio		0.02	0.01		0.16	0.01	0.05	0.41		0.03	0.21	0.00
Uniform Delay, d1		56.0	56.0		56.3	56.0	0.7	1.1		0.7	0.9	0.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.08	0.09	1.00
Incremental Delay, d2		0.1	0.1		1.3	0.1	0.1	0.4		0.1	0.2	0.0
Delay (s)		56.1	56.0		57.6	56.0	0.8	1.5		0.2	0.2	0.3
Level of Service		E	E		E	E	A	A		A	A	A
Approach Delay (s)		56.1			56.7			1.5			0.2	
Approach LOS		E			E			A			A	

Intersection Summary

HCM 2000 Control Delay	2.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	310	1574	15	1139	99	245
v/c Ratio	0.82	0.69	0.09	0.73	0.24	0.74
Control Delay	46.1	6.2	9.9	21.9	39.1	52.1
Queue Delay	0.0	0.3	0.0	0.0	0.0	0.0
Total Delay	46.1	6.5	9.9	21.9	39.1	52.1
Queue Length 50th (ft)	127	60	3	241	62	154
Queue Length 95th (ft)	216	106	m5	327	111	#271
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	429	2266	164	1555	417	331
Starvation Cap Reductn	0	181	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.75	0.09	0.73	0.24	0.74

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.




Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

18: Kingston Pike & Lendon Welsch Way

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	1444	4	14	840	208	0	85	6	111	9	105
Future Volume (vph)	285	1444	4	14	840	208	0	85	6	111	9	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	0.97			0.99			0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1687	3573		1805	3374			1882			1698	
Flt Permitted	0.12	1.00		0.11	1.00			1.00			0.79	
Satd. Flow (perm)	207	3573		212	3374			1882			1380	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	1570	4	15	913	226	0	92	7	121	10	114
RTOR Reduction (vph)	0	0	0	0	17	0	0	2	0	0	26	0
Lane Group Flow (vph)	310	1574	0	15	1122	0	0	97	0	0	219	0
Heavy Vehicles (%)	7%	1%	0%	0%	4%	3%	0%	0%	0%	1%	0%	4%
Turn Type	pm+pt	NA		pm+pt	NA			NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	80.5	72.2		56.5	54.7			26.5			26.5	
Effective Green, g (s)	80.5	72.2		56.5	54.7			26.5			26.5	
Actuated g/C Ratio	0.67	0.60		0.47	0.46			0.22			0.22	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	376	2149		123	1537			415			304	
v/s Ratio Prot	c0.13	0.44		0.00	0.33			0.05				
v/s Ratio Perm	c0.42			0.06							c0.16	
v/c Ratio	0.82	0.73		0.12	0.73			0.23			0.72	
Uniform Delay, d1	27.3	17.0		18.2	26.6			38.4			43.3	
Progression Factor	1.48	0.32		0.93	0.72			1.00			1.00	
Incremental Delay, d2	10.2	1.6		0.3	2.4			1.3			7.9	
Delay (s)	50.6	7.1		17.3	21.6			39.7			51.2	
Level of Service	D	A		B	C			D			D	
Approach Delay (s)		14.2			21.6			39.7			51.2	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			20.2			HCM 2000 Level of Service					C	
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			19.5			
Intersection Capacity Utilization			81.6%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR
Lane Group Flow (vph)	1757	27	112	904	29	29	154
v/c Ratio	0.71	0.02	0.62	0.32	0.27	0.27	0.44
Control Delay	7.3	0.0	25.6	1.5	59.1	59.1	5.4
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Total Delay	7.3	0.0	25.6	1.6	59.1	59.1	5.4
Queue Length 50th (ft)	178	0	22	40	23	23	0
Queue Length 95th (ft)	286	m0	m56	47	55	55	17
Internal Link Dist (ft)	937			449		417	
Turn Bay Length (ft)		100	125		200		200
Base Capacity (vph)	2484	1222	180	2814	264	264	350
Starvation Cap Reductn	0	0	0	489	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.02	0.62	0.39	0.11	0.11	0.44























Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

22: Brooklawn St & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1616	25	103	828	4	53	0	142	0	0	0
Future Volume (vph)	0	1616	25	103	828	4	53	0	142	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5			
Lane Util. Factor		0.95	1.00	1.00	0.95		0.95	0.95	1.00			
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85			
Flt Protected		1.00	1.00	0.95	1.00		0.95	0.95	1.00			
Satd. Flow (prot)		3539	1615	1805	3499		1715	1715	1599			
Flt Permitted		1.00	1.00	0.08	1.00		0.95	0.95	1.00			
Satd. Flow (perm)		3539	1615	150	3499		1715	1715	1599			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1757	27	112	900	4	58	0	154	0	0	0
RTOR Reduction (vph)	0	0	8	0	0	0	0	0	140	0	0	0
Lane Group Flow (vph)	0	1757	19	112	904	0	29	29	14	0	0	0
Heavy Vehicles (%)	0%	2%	0%	0%	3%	25%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov			
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)		80.3	83.0	91.3	91.3		6.5	6.5	11.0			
Effective Green, g (s)		80.3	83.0	91.3	91.3		6.5	6.5	11.0			
Actuated g/C Ratio		0.67	0.69	0.76	0.76		0.05	0.05	0.09			
Clearance Time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5			
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		2368	1117	176	2662		92	92	146			
v/s Ratio Prot		c0.50	c0.00	c0.02	0.26		c0.02	0.02	0.00			
v/s Ratio Perm			0.01	0.46					0.01			
v/c Ratio		0.74	0.02	0.64	0.34		0.32	0.32	0.10			
Uniform Delay, d1		13.0	5.8	30.7	4.6		54.6	54.6	49.9			
Progression Factor		0.49	1.00	0.68	0.29		1.00	1.00	1.00			
Incremental Delay, d2		1.1	0.0	4.9	0.2		2.0	2.0	0.3			
Delay (s)		7.6	5.8	25.9	1.6		56.6	56.6	50.2			
Level of Service		A	A	C	A		E	E	D			
Approach Delay (s)		7.6			4.3			52.0			0.0	
Approach LOS		A			A			D			A	
Intersection Summary												
HCM 2000 Control Delay			9.6			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			70.8%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	50	1218	502	1671	153	78	348	126	152
v/c Ratio	0.37	0.96	0.97	0.79	0.64	0.51	0.61	0.31	0.70
Control Delay	21.2	36.0	69.7	24.3	69.3	64.8	21.8	57.0	60.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.2	36.0	69.7	24.3	69.3	64.8	21.8	57.0	60.2
Queue Length 50th (ft)	10	352	369	574	64	55	70	51	97
Queue Length 95th (ft)	m25	#675	#598	684	#137	95	122	87	167
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	135	1266	519	2112	239	259	569	401	277
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	1	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.96	0.97	0.79	0.64	0.30	0.61	0.31	0.55

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	46	1073	48	462	1446	91	141	72	320	116	68	72
Future Volume (vph)	46	1073	48	462	1446	91	141	72	320	116	68	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3499		1770	3508		3335	1827	1538	3502	1745	
Flt Permitted	0.10	1.00		0.08	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	183	3499		143	3508		3335	1827	1538	3502	1745	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	1166	52	502	1572	99	153	78	348	126	74	78
RTOR Reduction (vph)	0	3	0	0	3	0	0	0	56	0	30	0
Lane Group Flow (vph)	50	1215	0	502	1668	0	153	78	292	126	122	0
Heavy Vehicles (%)	0%	2%	14%	2%	2%	2%	5%	4%	5%	0%	1%	0%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6					8			
Actuated Green, G (s)	49.5	45.6		86.0	75.6		10.6	9.6	43.5	14.9	13.9	
Effective Green, g (s)	49.5	45.6		86.0	75.6		10.6	9.6	43.5	14.9	13.9	
Actuated g/C Ratio	0.38	0.35		0.66	0.58		0.08	0.07	0.33	0.11	0.11	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	118	1227		518	2040		271	134	514	401	186	
v/s Ratio Prot	0.01	0.35		c0.25	0.48		c0.05	0.04	0.15	c0.04	c0.07	
v/s Ratio Perm	0.15			c0.39					0.04			
v/c Ratio	0.42	0.99		0.97	0.82		0.56	0.58	0.57	0.31	0.65	
Uniform Delay, d1	26.8	42.0		40.2	21.7		57.5	58.3	35.5	52.9	55.7	
Progression Factor	0.91	0.45		1.00	1.00		0.96	0.95	0.91	1.00	1.00	
Incremental Delay, d2	2.1	21.6		31.3	3.8		2.7	6.2	1.4	0.5	8.0	
Delay (s)	26.4	40.5		71.6	25.5		57.9	61.5	33.8	53.3	63.7	
Level of Service	C	D		E	C		E	E	C	D	E	
Approach Delay (s)		39.9			36.1			43.9			59.0	
Approach LOS		D			D			D			E	
Intersection Summary												
HCM 2000 Control Delay		39.8			HCM 2000 Level of Service			D				
HCM 2000 Volume to Capacity ratio		0.91										
Actuated Cycle Length (s)		130.0			Sum of lost time (s)			26.0				
Intersection Capacity Utilization		90.5%			ICU Level of Service			E				
Analysis Period (min)		15										
c Critical Lane Group												

Queues

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	487	991	408	93	1339	486	375	514	418	699	701
v/c Ratio	1.29	0.60	0.43	0.39	1.13	0.64	1.40	0.88	1.56	1.19	0.99
Control Delay	183.1	27.7	3.3	22.7	95.2	12.8	224.1	38.2	305.7	149.8	62.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	183.1	27.7	3.3	22.7	95.2	12.8	224.1	38.2	305.7	149.8	62.4
Queue Length 50th (ft)	~474	319	0	37	~681	86	~354	195	~497	~374	499
Queue Length 95th (ft)	#693	389	56	m41	#814	336	#547	#302	#703	#500	#772
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	377	1646	954	241	1184	764	268	583	268	585	710
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.29	0.60	0.43	0.39	1.13	0.64	1.40	0.88	1.56	1.19	0.99













Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	448	912	375	86	1232	447	345	404	69	385	643	645
Future Volume (vph)	448	912	375	86	1232	447	345	404	69	385	643	645
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3462		1770	3539	1583
Flt Permitted	0.11	1.00	1.00	0.29	1.00	1.00	0.67	1.00		0.67	1.00	1.00
Satd. Flow (perm)	201	3539	1583	539	3539	1583	1242	3462		1242	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	487	991	408	93	1339	486	375	439	75	418	699	701
RTOR Reduction (vph)	0	0	218	0	0	46	0	11	0	0	0	90
Lane Group Flow (vph)	487	991	190	93	1339	440	375	503	0	418	699	611
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	60.5	60.5	60.5	43.5	43.5	59.0	21.5	21.5		21.5	21.5	45.0
Effective Green, g (s)	60.5	60.5	60.5	43.5	43.5	59.0	21.5	21.5		21.5	21.5	45.0
Actuated g/C Ratio	0.47	0.47	0.47	0.33	0.33	0.45	0.17	0.17		0.17	0.17	0.35
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	377	1646	736	241	1184	718	268	572		268	585	627
v/s Ratio Prot	c0.23	0.28		0.02	c0.38	0.07	c0.17	0.15		c0.19	0.20	0.18
v/s Ratio Perm	c0.37		0.12	0.11		0.20	0.06			c0.07		0.21
v/c Ratio	1.29	0.60	0.26	0.39	1.13	0.61	1.40	0.88		1.56	1.19	0.97
Uniform Delay, d1	40.6	25.8	21.1	34.8	43.2	26.9	53.7	53.0		53.0	54.2	41.9
Progression Factor	1.00	1.00	1.00	0.53	0.64	0.82	0.42	0.39		1.00	1.00	1.00
Incremental Delay, d2	149.8	1.6	0.8	0.7	67.1	1.1	200.2	17.0		269.4	103.7	29.3
Delay (s)	190.4	27.4	22.0	19.1	94.9	23.1	222.6	37.5		322.3	157.9	71.2
Level of Service	F	C	C	B	F	C	F	D		F	F	E
Approach Delay (s)		68.3			73.1			115.6			162.3	
Approach LOS		E			E			F			F	
Intersection Summary												
HCM 2000 Control Delay			102.4			HCM 2000 Level of Service		F				
HCM 2000 Volume to Capacity ratio			1.36									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)		26.0				
Intersection Capacity Utilization			117.4%			ICU Level of Service		H				
Analysis Period (min)			15									
c Critical Lane Group												

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	230	1114	50	704
v/c Ratio	0.76	0.43	0.16	0.27
Control Delay	63.7	4.5	7.8	6.9
Queue Delay	0.0	0.1	0.0	0.0
Total Delay	63.7	4.6	7.8	6.9
Queue Length 50th (ft)	175	58	11	86
Queue Length 95th (ft)	249	m82	24	104
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	544	2607	319	2575
Starvation Cap Reductn	0	534	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.42	0.54	0.16	0.27

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	150	62	922	103	46	648
Future Volume (vph)	150	62	922	103	46	648
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.98		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1753		3541		1805	3505
Flt Permitted	0.97		1.00		0.23	1.00
Satd. Flow (perm)	1753		3541		434	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	67	1002	112	50	704
RTOR Reduction (vph)	13	0	4	0	0	0
Lane Group Flow (vph)	217	0	1110	0	50	704
Heavy Vehicles (%)	0%	2%	0%	4%	0%	3%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	21.5		95.5		95.5	95.5
Effective Green, g (s)	21.5		95.5		95.5	95.5
Actuated g/C Ratio	0.17		0.73		0.73	0.73
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	289		2601		318	2574
v/s Ratio Prot	c0.12		c0.31			0.20
v/s Ratio Perm					0.12	
v/c Ratio	0.75		0.43		0.16	0.27
Uniform Delay, d1	51.7		6.7		5.2	5.7
Progression Factor	1.00		0.59		1.00	1.05
Incremental Delay, d2	10.2		0.2		1.0	0.3
Delay (s)	61.9		4.2		6.2	6.3
Level of Service	E		A		A	A
Approach Delay (s)	61.9		4.2			6.3
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	58	1018	687	127	223	61
v/c Ratio	0.14	0.48	0.38	0.09	0.39	0.11
Control Delay	10.3	10.8	13.5	0.1	36.8	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.3	10.8	13.5	0.1	36.8	8.0
Queue Length 50th (ft)	14	140	81	0	146	0
Queue Length 95th (ft)	29	167	101	0	220	33
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	450	2130	1820	1444	576	557
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.48	0.38	0.09	0.39	0.11
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	←	↑↑	↑↑	↑	←	↑
Traffic Volume (vph)	53	937	632	117	205	56
Future Volume (vph)	53	937	632	117	205	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1615	1805	1615
Flt Permitted	0.30	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	572	3574	3574	1615	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	58	1018	687	127	223	61
RTOR Reduction (vph)	0	0	0	23	0	42
Lane Group Flow (vph)	58	1018	687	104	223	19
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	77.5	77.5	64.9	106.4	41.5	41.5
Effective Green, g (s)	77.5	77.5	64.9	106.4	41.5	41.5
Actuated g/C Ratio	0.60	0.60	0.50	0.82	0.32	0.32
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	398	2130	1784	1321	576	515
v/s Ratio Prot	0.01	c0.28	0.19	0.03	c0.12	
v/s Ratio Perm	0.08			0.04		0.01
v/c Ratio	0.15	0.48	0.39	0.08	0.39	0.04
Uniform Delay, d1	12.1	14.8	20.2	2.3	34.4	30.5
Progression Factor	0.87	0.68	0.64	0.02	1.00	1.00
Incremental Delay, d2	0.2	0.7	0.6	0.1	2.0	0.1
Delay (s)	10.6	10.7	13.4	0.2	36.3	30.6
Level of Service	B	B	B	A	D	C
Approach Delay (s)		10.7	11.4		35.1	
Approach LOS		B	B		D	

Intersection Summary

HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	75	1215	802	482	690	45
v/c Ratio	0.21	0.61	0.48	0.34	0.58	0.08
Control Delay	6.3	7.5	25.3	0.8	37.5	8.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.3	7.5	25.3	0.8	37.5	8.5
Queue Length 50th (ft)	14	125	247	0	245	0
Queue Length 95th (ft)	22	147	306	14	308	27
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	360	1993	1685	1418	1186	566
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.61	0.48	0.34	0.58	0.08

Intersection Summary

HCM Signalized Intersection Capacity Analysis

11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	69	1118	738	443	635	41
Future Volume (vph)	69	1118	738	443	635	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1553	3467	1568
Flt Permitted	0.27	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	514	3574	3574	1553	3467	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	1215	802	482	690	45
RTOR Reduction (vph)	0	0	0	95	0	30
Lane Group Flow (vph)	75	1215	802	387	690	15
Heavy Vehicles (%)	0%	1%	1%	4%	1%	3%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	72.5	72.5	60.0	104.5	44.5	44.5
Effective Green, g (s)	72.5	72.5	60.0	104.5	44.5	44.5
Actuated g/C Ratio	0.56	0.56	0.46	0.80	0.34	0.34
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	346	1993	1649	1326	1186	536
v/s Ratio Prot	0.01	c0.34	0.22	0.10	c0.20	
v/s Ratio Perm	0.11			0.15		0.01
v/c Ratio	0.22	0.61	0.49	0.29	0.58	0.03
Uniform Delay, d1	22.8	19.3	24.3	3.3	35.1	28.4
Progression Factor	0.32	0.32	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	1.3	1.0	0.6	2.1	0.1
Delay (s)	7.7	7.4	25.3	3.8	37.2	28.5
Level of Service	A	A	C	A	D	C
Approach Delay (s)		7.4	17.3		36.7	
Approach LOS		A	B		D	

Intersection Summary

HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Concord Rd & Site Access

10/27/2020



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	2	32	91	84	18	535	12	624	3
v/c Ratio	0.01	0.16	0.61	0.35	0.03	0.19	0.02	0.40	0.00
Control Delay	49.0	17.7	72.4	14.2	2.8	2.7	1.5	2.2	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
Total Delay	49.0	17.7	72.4	14.2	2.8	2.7	1.5	2.6	0.0
Queue Length 50th (ft)	2	0	75	0	2	36	1	43	0
Queue Length 95th (ft)	10	31	128	48	8	64	m1	m60	m0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	379	379	312	416	625	2867	711	1554	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	452	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.08	0.29	0.20	0.03	0.19	0.02	0.57	0.00























Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	29	74	10	77	17	457	35	11	574	3
Future Volume (vph)	1	1	29	74	10	77	17	457	35	11	574	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1854	1615		1820	1599	1805	3468		1805	1881	1615
Flt Permitted		0.91	1.00		0.75	1.00	0.40	1.00		0.45	1.00	1.00
Satd. Flow (perm)		1731	1615		1426	1599	757	3468		861	1881	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1	32	80	11	84	18	497	38	12	624	3
RTOR Reduction (vph)	0	0	29	0	0	75	0	3	0	0	0	0
Lane Group Flow (vph)	0	2	3	0	91	9	18	532	0	12	624	3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	3%	3%	0%	1%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		13.5	13.5		13.5	13.5	107.5	107.5		107.5	107.5	121.0
Effective Green, g (s)		13.5	13.5		13.5	13.5	107.5	107.5		107.5	107.5	121.0
Actuated g/C Ratio		0.10	0.10		0.10	0.10	0.83	0.83		0.83	0.83	0.93
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		179	167		148	166	625	2867		711	1555	1615
v/s Ratio Prot								0.15			c0.33	0.00
v/s Ratio Perm		0.00	0.00		c0.06	0.01	0.02			0.01		0.00
v/c Ratio		0.01	0.02		0.61	0.05	0.03	0.19		0.02	0.40	0.00
Uniform Delay, d1		52.3	52.3		55.8	52.5	2.0	2.3		2.0	2.9	0.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.51	0.55	1.00
Incremental Delay, d2		0.0	0.0		7.4	0.1	0.1	0.1		0.0	0.3	0.0
Delay (s)		52.3	52.4		63.1	52.6	2.1	2.4		1.0	1.9	0.3
Level of Service		D	D		E	D	A	A		A	A	A
Approach Delay (s)		52.4			58.1			2.4			1.9	
Approach LOS		D			E			A			A	

Intersection Summary

HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	39	1366	35	1925	45	83
v/c Ratio	0.31	0.55	0.13	0.81	0.19	0.31
Control Delay	27.7	2.2	3.6	5.7	31.0	22.4
Queue Delay	0.0	0.0	0.0	0.5	0.0	0.0
Total Delay	27.7	2.2	3.6	6.2	31.0	22.5
Queue Length 50th (ft)	2	31	4	131	16	19
Queue Length 95th (ft)	m27	45	m6	144	54	69
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	130	2499	278	2390	236	266
Starvation Cap Reductn	0	0	0	35	0	0
Spillback Cap Reductn	0	0	0	147	0	2
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.55	0.13	0.86	0.19	0.31













Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

18: Kingston Pike & Lendon Welsch Way

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1245	12	32	1740	31	18	2	21	17	6	53
Future Volume (vph)	36	1245	12	32	1740	31	18	2	21	17	6	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.93			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1570	3533		1805	3523			1730			1626	
Flt Permitted	0.05	1.00		0.18	1.00			0.86			0.93	
Satd. Flow (perm)	78	3533		337	3523			1525			1524	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1353	13	35	1891	34	20	2	23	18	7	58
RTOR Reduction (vph)	0	1	0	0	1	0	0	20	0	0	50	0
Lane Group Flow (vph)	39	1365	0	35	1924	0	0	25	0	0	33	0
Heavy Vehicles (%)	15%	2%	6%	0%	2%	14%	0%	0%	0%	12%	0%	3%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	89.3	89.3		86.9	86.9			18.5			18.5	
Effective Green, g (s)	89.3	89.3		86.9	86.9			18.5			18.5	
Actuated g/C Ratio	0.69	0.69		0.67	0.67			0.14			0.14	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	112	2426		255	2354			217			216	
v/s Ratio Prot	0.01	c0.39		0.00	c0.55							
v/s Ratio Perm	0.22			0.09				0.02			c0.02	
v/c Ratio	0.35	0.56		0.14	0.82			0.12			0.15	
Uniform Delay, d1	20.8	10.4		11.5	15.7			48.6			48.9	
Progression Factor	3.02	0.15		0.32	0.23			1.00			1.00	
Incremental Delay, d2	1.6	0.8		0.2	2.3			1.1			0.3	
Delay (s)	64.4	2.3		3.9	5.9			49.7			49.2	
Level of Service	E	A		A	A			D			D	
Approach Delay (s)		4.1			5.8			49.7			49.2	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay	6.7			HCM 2000 Level of Service			A					
HCM 2000 Volume to Capacity ratio	0.71											
Actuated Cycle Length (s)	130.0			Sum of lost time (s)			19.5					
Intersection Capacity Utilization	64.8%			ICU Level of Service			C					
Analysis Period (min)	15											
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	3	1178	67	203	1750	98	98	187	11
v/c Ratio	0.02	0.58	0.07	0.69	0.72	0.59	0.59	0.42	0.12
Control Delay	3.3	8.1	0.1	23.4	9.7	69.5	69.5	6.4	49.3
Queue Delay	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Total Delay	3.3	8.1	0.1	23.4	10.0	69.5	69.5	6.4	49.3
Queue Length 50th (ft)	0	76	0	33	75	84	84	0	6
Queue Length 95th (ft)	m1	m239	m1	m90	#938	143	143	42	26
Internal Link Dist (ft)		937			449		417		100
Turn Bay Length (ft)	125		100	125		200		200	
Base Capacity (vph)	130	2016	1030	296	2415	244	244	445	255
Starvation Cap Reductn	0	0	0	0	178	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.58	0.07	0.69	0.78	0.40	0.40	0.42	0.04

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.


















Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

22: Brooklawn St & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1084	62	187	1607	3	180	0	172	4	3	4
Future Volume (vph)	3	1084	62	187	1607	3	180	0	172	4	3	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (prot)	1805	3539	1615	1787	3573		1715	1715	1615		1774	
Flt Permitted	0.06	1.00	1.00	0.14	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (perm)	119	3539	1615	269	3573		1715	1715	1615		1774	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	1178	67	203	1747	3	196	0	187	4	3	4
RTOR Reduction (vph)	0	0	32	0	0	0	0	0	148	0	4	0
Lane Group Flow (vph)	3	1178	35	203	1750	0	98	98	39	0	7	0
Heavy Vehicles (%)	0%	2%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)	64.6	63.7	67.3	84.9	77.5		12.7	12.7	27.4		2.8	
Effective Green, g (s)	64.6	63.7	67.3	84.9	77.5		12.7	12.7	27.4		2.8	
Actuated g/C Ratio	0.50	0.49	0.52	0.65	0.60		0.10	0.10	0.21		0.02	
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	70	1734	836	347	2130		167	167	340		38	
v/s Ratio Prot	0.00	0.33	c0.00	c0.07	c0.49		c0.06	0.06	0.01		c0.00	
v/s Ratio Perm	0.02		0.02	0.32					0.01			
v/c Ratio	0.04	0.68	0.04	0.59	0.82		0.59	0.59	0.12		0.19	
Uniform Delay, d1	50.2	25.3	15.5	33.0	20.8		56.1	56.1	41.5		62.5	
Progression Factor	0.25	0.36	1.00	0.53	0.43		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.1	1.0	0.0	1.5	2.3		5.2	5.2	0.2		2.4	
Delay (s)	12.4	10.2	15.5	19.1	11.1		61.3	61.3	41.7		64.9	
Level of Service	B	B	B	B	B		E	E	D		E	
Approach Delay (s)		10.4			12.0			51.7			64.9	
Approach LOS		B			B			D			E	
Intersection Summary												
HCM 2000 Control Delay			15.8			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			76.1%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	50	1218	502	1671	153	78	348	126	152
v/c Ratio	0.37	1.00	0.96	0.81	0.62	0.50	0.36	0.31	0.69
Control Delay	22.7	44.5	66.4	25.3	65.5	62.1	13.2	54.3	56.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	44.5	66.4	25.3	65.5	62.1	13.2	54.3	56.4
Queue Length 50th (ft)	12	343	~377	574	61	53	35	48	91
Queue Length 95th (ft)	m23	#655	#595	689	#130	93	48	84	159
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	135	1220	524	2067	247	270	969	412	288
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	1.00	0.96	0.81	0.62	0.29	0.36	0.31	0.53

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱	↱	↰	↱	
Traffic Volume (vph)	46	1073	48	462	1446	91	141	72	320	116	68	72
Future Volume (vph)	46	1073	48	462	1446	91	141	72	320	116	68	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	0.88	0.97	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3499		1770	3508		3335	1827	2707	3502	1745	
Flt Permitted	0.09	1.00		0.08	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	180	3499		153	3508		3335	1827	2707	3502	1745	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	1166	52	502	1572	99	153	78	348	126	74	78
RTOR Reduction (vph)	0	3	0	0	3	0	0	0	58	0	32	0
Lane Group Flow (vph)	50	1215	0	502	1668	0	153	78	290	126	120	0
Heavy Vehicles (%)	0%	2%	14%	2%	2%	2%	5%	4%	5%	0%	1%	0%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6					8			
Actuated Green, G (s)	46.1	42.2		81.4	71.0		10.6	9.4	42.1	14.7	13.5	
Effective Green, g (s)	46.1	42.2		81.4	71.0		10.6	9.4	42.1	14.7	13.5	
Actuated g/C Ratio	0.37	0.34		0.65	0.57		0.08	0.08	0.34	0.12	0.11	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	117	1181		522	1992		282	137	911	411	188	
v/s Ratio Prot	0.01	c0.35		c0.25	0.48		c0.05	0.04	0.08	c0.04	c0.07	
v/s Ratio Perm	0.14			0.37					0.02			
v/c Ratio	0.43	1.03		0.96	0.84		0.54	0.57	0.32	0.31	0.64	
Uniform Delay, d1	26.9	41.4		38.2	22.2		54.9	55.8	30.8	50.5	53.4	
Progression Factor	1.04	0.48		1.00	1.00		0.96	0.95	0.86	1.00	1.00	
Incremental Delay, d2	2.1	31.8		29.7	4.4		2.1	5.3	0.2	0.4	6.9	
Delay (s)	30.1	51.6		67.9	26.6		54.7	58.5	26.8	50.9	60.3	
Level of Service	C	D		E	C		D	E	C	D	E	
Approach Delay (s)		50.8			36.2			38.4			56.1	
Approach LOS		D			D			D			E	
Intersection Summary												
HCM 2000 Control Delay			42.1			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)			26.0			
Intersection Capacity Utilization			90.5%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	487	991	408	93	1339	486	375	514	418	699	701
v/c Ratio	0.78	0.59	0.43	0.35	1.00	0.59	1.07	0.85	0.85	1.01	0.98
Control Delay	38.8	25.6	4.0	17.4	44.6	7.5	90.7	32.7	68.4	86.2	60.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.8	25.6	4.0	17.4	44.6	7.5	90.7	32.7	68.4	86.2	60.0
Queue Length 50th (ft)	143	299	11	30	499	38	~127	181	160	~303	472
Queue Length 95th (ft)	205	367	66	m24	#711	185	#209	#279	#240	#435	#744
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	624	1684	954	268	1344	823	349	606	489	693	713
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.59	0.43	0.35	1.00	0.59	1.07	0.85	0.85	1.01	0.98

























Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	448	912	375	86	1232	447	345	404	69	385	643	645
Future Volume (vph)	448	912	375	86	1232	447	345	404	69	385	643	645
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583	3433	3462		3433	3539	1583
Flt Permitted	0.10	1.00	1.00	0.29	1.00	1.00	0.31	1.00		0.46	1.00	1.00
Satd. Flow (perm)	353	3539	1583	539	3539	1583	1112	3462		1671	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	487	991	408	93	1339	486	375	439	75	418	699	701
RTOR Reduction (vph)	0	0	201	0	0	76	0	11	0	0	0	94
Lane Group Flow (vph)	487	991	207	93	1339	410	375	503	0	418	699	607
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	59.5	59.5	59.5	47.5	47.5	59.0	21.5	21.5		24.5	24.5	43.0
Effective Green, g (s)	59.5	59.5	59.5	47.5	47.5	59.0	21.5	21.5		24.5	24.5	43.0
Actuated g/C Ratio	0.48	0.48	0.48	0.38	0.38	0.47	0.17	0.17		0.20	0.20	0.34
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	623	1684	753	268	1344	747	349	595		489	693	626
v/s Ratio Prot	0.12	0.28		0.02	c0.38	0.05	0.07	c0.15		0.08	c0.20	c0.14
v/s Ratio Perm	0.26		0.13	0.11		0.21	0.11			0.09		0.24
v/c Ratio	0.78	0.59	0.28	0.35	1.00	0.55	1.07	0.85		0.85	1.01	0.97
Uniform Delay, d1	33.2	23.8	19.7	29.0	38.7	23.5	50.3	50.1		47.8	50.2	40.3
Progression Factor	1.00	1.00	1.00	0.48	0.60	0.55	0.37	0.37		1.00	1.00	1.00
Incremental Delay, d2	6.3	1.5	0.9	0.6	20.0	0.6	68.7	13.5		13.6	36.3	28.0
Delay (s)	39.6	25.4	20.7	14.5	43.3	13.5	87.1	32.1		61.4	86.6	68.3
Level of Service	D	C	C	B	D	B	F	C		E	F	E
Approach Delay (s)		28.0			34.3			55.3			73.8	
Approach LOS		C			C			E			E	
Intersection Summary												
HCM 2000 Control Delay			46.4			HCM 2000 Level of Service		D				
HCM 2000 Volume to Capacity ratio			1.07									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)		26.0				
Intersection Capacity Utilization			100.1%			ICU Level of Service		G				
Analysis Period (min)			15									
c Critical Lane Group												

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	230	1114	50	704
v/c Ratio	0.76	0.43	0.16	0.28
Control Delay	61.2	3.8	7.6	6.5
Queue Delay	0.0	0.1	0.0	0.0
Total Delay	61.2	3.9	7.6	6.5
Queue Length 50th (ft)	167	66	10	79
Queue Length 95th (ft)	240	m98	22	97
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	524	2591	316	2560
Starvation Cap Reductn	0	382	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.44	0.50	0.16	0.28

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	150	62	922	103	46	648
Future Volume (vph)	150	62	922	103	46	648
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.98		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1753		3541		1805	3505
Flt Permitted	0.97		1.00		0.23	1.00
Satd. Flow (perm)	1753		3541		434	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	67	1002	112	50	704
RTOR Reduction (vph)	14	0	5	0	0	0
Lane Group Flow (vph)	216	0	1109	0	50	704
Heavy Vehicles (%)	0%	2%	0%	4%	0%	3%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	20.7		91.3		91.3	91.3
Effective Green, g (s)	20.7		91.3		91.3	91.3
Actuated g/C Ratio	0.17		0.73		0.73	0.73
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	290		2586		316	2560
v/s Ratio Prot	c0.12		c0.31			0.20
v/s Ratio Perm					0.12	
v/c Ratio	0.74		0.43		0.16	0.28
Uniform Delay, d1	49.6		6.6		5.1	5.7
Progression Factor	1.00		0.49		0.97	1.00
Incremental Delay, d2	9.9		0.3		1.0	0.3
Delay (s)	59.5		3.6		6.0	6.0
Level of Service	E		A		A	A
Approach Delay (s)	59.5		3.6			6.0
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	58	1018	687	127	223	61
v/c Ratio	0.14	0.48	0.38	0.09	0.39	0.11
Control Delay	9.4	10.7	12.6	0.1	35.9	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.4	10.7	12.6	0.1	35.9	7.9
Queue Length 50th (ft)	13	130	74	0	141	0
Queue Length 95th (ft)	27	155	93	1	215	32
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	453	2130	1809	1438	570	552
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.48	0.38	0.09	0.39	0.11
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	53	937	632	117	205	56
Future Volume (vph)	53	937	632	117	205	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1615	1805	1615
Flt Permitted	0.30	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	570	3574	3574	1615	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	58	1018	687	127	223	61
RTOR Reduction (vph)	0	0	0	24	0	42
Lane Group Flow (vph)	58	1018	687	103	223	19
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	74.5	74.5	62.0	101.5	39.5	39.5
Effective Green, g (s)	74.5	74.5	62.0	101.5	39.5	39.5
Actuated g/C Ratio	0.60	0.60	0.50	0.81	0.32	0.32
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	399	2130	1772	1311	570	510
v/s Ratio Prot	0.01	c0.28	0.19	0.02	c0.12	
v/s Ratio Perm	0.08			0.04		0.01
v/c Ratio	0.15	0.48	0.39	0.08	0.39	0.04
Uniform Delay, d1	11.6	14.3	19.7	2.4	33.4	29.6
Progression Factor	0.81	0.69	0.61	0.02	1.00	1.00
Incremental Delay, d2	0.2	0.7	0.6	0.1	2.0	0.1
Delay (s)	9.6	10.6	12.6	0.1	35.4	29.7
Level of Service	A	B	B	A	D	C
Approach Delay (s)		10.5	10.7		34.2	
Approach LOS		B	B		C	

Intersection Summary

HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	75	1215	802	482	690	45
v/c Ratio	0.21	0.62	0.49	0.34	0.57	0.08
Control Delay	6.9	7.7	25.6	0.8	35.5	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.9	7.7	25.6	0.8	35.5	8.1
Queue Length 50th (ft)	13	130	243	0	232	0
Queue Length 95th (ft)	22	159	304	14	294	27
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	355	1958	1638	1412	1206	575
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.62	0.49	0.34	0.57	0.08
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	69	1118	738	443	635	41
Future Volume (vph)	69	1118	738	443	635	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1553	3467	1568
Flt Permitted	0.27	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	507	3574	3574	1553	3467	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	1215	802	482	690	45
RTOR Reduction (vph)	0	0	0	98	0	29
Lane Group Flow (vph)	75	1215	802	384	690	16
Heavy Vehicles (%)	0%	1%	1%	4%	1%	3%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	68.5	68.5	56.0	99.5	43.5	43.5
Effective Green, g (s)	68.5	68.5	56.0	99.5	43.5	43.5
Actuated g/C Ratio	0.55	0.55	0.45	0.80	0.35	0.35
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	340	1958	1601	1316	1206	545
v/s Ratio Prot	0.01	c0.34	0.22	0.10	c0.20	
v/s Ratio Perm	0.11			0.15		0.01
v/c Ratio	0.22	0.62	0.50	0.29	0.57	0.03
Uniform Delay, d1	22.8	19.3	24.6	3.4	33.2	26.8
Progression Factor	0.35	0.32	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	1.4	1.1	0.6	2.0	0.1
Delay (s)	8.4	7.6	25.7	3.9	35.1	26.9
Level of Service	A	A	C	A	D	C
Approach Delay (s)		7.6	17.5		34.6	
Approach LOS		A	B		C	

Intersection Summary

HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Concord Rd & Site Access

10/27/2020



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	2	32	91	84	18	535	12	624	3
v/c Ratio	0.01	0.16	0.61	0.34	0.03	0.19	0.02	0.40	0.00
Control Delay	47.0	17.1	69.3	13.9	2.8	2.7	1.5	2.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0
Total Delay	47.0	17.1	69.3	13.9	2.8	2.7	1.5	2.9	0.0
Queue Length 50th (ft)	1	0	71	0	2	36	1	44	0
Queue Length 95th (ft)	9	30	124	47	8	64	m1	m63	m0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	380	380	313	417	621	2852	707	1546	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	444	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.08	0.29	0.20	0.03	0.19	0.02	0.57	0.00

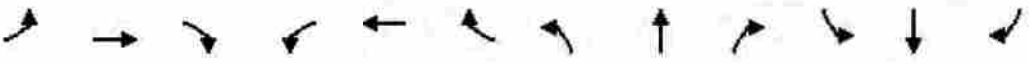
Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘		↗	↘	↗	↘		↗	↘	↗
Traffic Volume (vph)	1	1	29	74	10	77	17	457	35	11	574	3
Future Volume (vph)	1	1	29	74	10	77	17	457	35	11	574	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1854	1615		1820	1599	1805	3468		1805	1881	1615
Flt Permitted		0.91	1.00		0.75	1.00	0.40	1.00		0.45	1.00	1.00
Satd. Flow (perm)		1729	1615		1426	1599	756	3468		861	1881	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1	32	80	11	84	18	497	38	12	624	3
RTOR Reduction (vph)	0	0	29	0	0	75	0	3	0	0	0	0
Lane Group Flow (vph)	0	2	3	0	91	9	18	532	0	12	624	3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	3%	3%	0%	1%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		13.2	13.2		13.2	13.2	102.8	102.8		102.8	102.8	116.0
Effective Green, g (s)		13.2	13.2		13.2	13.2	102.8	102.8		102.8	102.8	116.0
Actuated g/C Ratio		0.11	0.11		0.11	0.11	0.82	0.82		0.82	0.82	0.93
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		182	170		150	168	621	2852		708	1546	1615
v/s Ratio Prot								0.15			c0.33	0.00
v/s Ratio Perm		0.00	0.00		c0.06	0.01	0.02			0.01		0.00
v/c Ratio		0.01	0.02		0.61	0.05	0.03	0.19		0.02	0.40	0.00
Uniform Delay, d1		50.1	50.1		53.4	50.3	2.0	2.3		2.0	3.0	0.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.52	0.63	1.00
Incremental Delay, d2		0.0	0.0		6.8	0.1	0.1	0.1		0.0	0.3	0.0
Delay (s)		50.1	50.1		60.2	50.4	2.1	2.5		1.1	2.2	0.3
Level of Service		D	D		E	D	A	A		A	A	A
Approach Delay (s)		50.1			55.5			2.5			2.2	
Approach LOS		D			E			A			A	

Intersection Summary

HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	39	1366	35	1925	45	83
v/c Ratio	0.32	0.56	0.13	0.81	0.19	0.30
Control Delay	23.8	2.4	3.5	5.9	29.6	21.6
Queue Delay	0.0	0.0	0.0	0.7	0.0	0.0
Total Delay	23.8	2.4	3.5	6.6	29.6	21.6
Queue Length 50th (ft)	2	31	4	126	16	18
Queue Length 95th (ft)	m25	44	m6	139	52	66
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	123	2457	275	2364	241	275
Starvation Cap Reductn	0	80	0	58	0	0
Spillback Cap Reductn	0	0	0	169	1	2
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.57	0.13	0.88	0.19	0.30













Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

18: Kingston Pike & Lendon Welsch Way

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1245	12	32	1740	31	18	2	21	17	6	53
Future Volume (vph)	36	1245	12	32	1740	31	18	2	21	17	6	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.93			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1570	3533		1805	3523			1730			1626	
Flt Permitted	0.05	1.00		0.17	1.00			0.85			0.93	
Satd. Flow (perm)	83	3533		332	3523			1496			1525	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1353	13	35	1891	34	20	2	23	18	7	58
RTOR Reduction (vph)	0	1	0	0	1	0	0	20	0	0	49	0
Lane Group Flow (vph)	39	1365	0	35	1924	0	0	25	0	0	34	0
Heavy Vehicles (%)	15%	2%	6%	0%	2%	14%	0%	0%	0%	12%	0%	3%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	84.3	84.3		82.6	82.6			18.5			18.5	
Effective Green, g (s)	84.3	84.3		82.6	82.6			18.5			18.5	
Actuated g/C Ratio	0.67	0.67		0.66	0.66			0.15			0.15	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	108	2382		251	2327			221			225	
v/s Ratio Prot	0.01	c0.39		0.00	c0.55							
v/s Ratio Perm	0.23			0.09				0.02			c0.02	
v/c Ratio	0.36	0.57		0.14	0.83			0.11			0.15	
Uniform Delay, d1	20.8	10.8		12.0	15.9			46.2			46.4	
Progression Factor	2.53	0.16		0.32	0.23			1.00			1.00	
Incremental Delay, d2	1.8	0.9		0.2	2.4			1.1			0.3	
Delay (s)	54.3	2.6		4.0	6.1			47.2			46.7	
Level of Service	D	A		A	A			D			D	
Approach Delay (s)		4.0			6.0			47.2			46.7	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay	6.7			HCM 2000 Level of Service			A					
HCM 2000 Volume to Capacity ratio	0.72											
Actuated Cycle Length (s)	125.0			Sum of lost time (s)			19.5					
Intersection Capacity Utilization	64.8%			ICU Level of Service			C					
Analysis Period (min)	15											
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	3	1178	67	203	1750	98	98	187	11
v/c Ratio	0.02	0.57	0.06	0.70	0.71	0.58	0.58	0.42	0.12
Control Delay	3.7	7.9	0.1	23.3	10.8	66.4	66.4	6.7	47.3
Queue Delay	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	3.7	7.9	0.1	23.3	11.0	66.4	66.4	6.7	47.3
Queue Length 50th (ft)	0	77	0	30	92	81	81	0	6
Queue Length 95th (ft)	m1	271	m1	m#92	#935	137	137	41	25
Internal Link Dist (ft)		937			449		417		100
Turn Bay Length (ft)	125		100	125		200		200	
Base Capacity (vph)	137	2066	1055	292	2452	253	253	440	265
Starvation Cap Reductn	0	0	0	0	167	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.57	0.06	0.70	0.77	0.39	0.39	0.42	0.04

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

22: Brooklawn St & Kingston Pike

10/27/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↱	↰	↱	↱	↰	↱	↱	↰	↱	↱
Traffic Volume (vph)	3	1084	62	187	1607	3	180	0	172	4	3	4
Future Volume (vph)	3	1084	62	187	1607	3	180	0	172	4	3	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (prot)	1805	3539	1615	1787	3573		1715	1715	1615		1774	
Flt Permitted	0.07	1.00	1.00	0.14	1.00		0.95	0.95	1.00		0.98	
Satd. Flow (perm)	124	3539	1615	272	3573		1715	1715	1615		1774	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	1178	67	203	1747	3	196	0	187	4	3	4
RTOR Reduction (vph)	0	0	32	0	0	0	0	0	148	0	4	0
Lane Group Flow (vph)	3	1178	35	203	1750	0	98	98	39	0	7	0
Heavy Vehicles (%)	0%	2%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)	62.2	61.3	64.9	81.5	74.1		12.4	12.4	26.1		1.5	
Effective Green, g (s)	62.2	61.3	64.9	81.5	74.1		12.4	12.4	26.1		1.5	
Actuated g/C Ratio	0.50	0.49	0.52	0.65	0.59		0.10	0.10	0.21		0.01	
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	73	1735	838	343	2118		170	170	337		21	
v/s Ratio Prot	0.00	0.33	c0.00	c0.06	c0.49		c0.06	0.06	0.01		c0.00	
v/s Ratio Perm	0.02		0.02	0.32					0.01			
v/c Ratio	0.04	0.68	0.04	0.59	0.83		0.58	0.58	0.12		0.34	
Uniform Delay, d1	48.4	24.3	14.8	31.8	20.3		53.8	53.8	40.1		61.3	
Progression Factor	0.31	0.38	1.00	0.55	0.55		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.2	1.6	0.0	1.6	2.3		4.7	4.7	0.2		9.2	
Delay (s)	15.2	10.8	14.8	19.1	13.4		58.5	58.5	40.2		70.5	
Level of Service	B	B	B	B	B		E	E	D		E	
Approach Delay (s)		11.0			14.0			49.6			70.5	
Approach LOS		B			B			D			E	
Intersection Summary												
HCM 2000 Control Delay			17.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			76.1%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	214	1368	176	926	240	311	662	385	304
v/c Ratio	0.61	1.08	0.46	0.59	0.81	1.07	1.09	1.06	0.91
Control Delay	19.7	69.7	29.3	28.5	82.9	125.0	87.9	123.4	78.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.7	69.7	29.3	28.5	82.9	125.0	87.9	123.4	78.1
Queue Length 50th (ft)	35	~716	91	307	114	~313	~461	~198	229
Queue Length 95th (ft)	m56	#857	167	395	#200	#507	#859	#304	#390
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	395	1271	381	1574	296	291	610	362	352
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	1.08	0.46	0.59	0.81	1.07	1.09	1.06	0.86


Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	↑↑		←	↑↑		←	↑	↗	↗	↑	↘
Traffic Volume (vph)	197	1188	71	162	642	210	221	286	609	354	105	175
Future Volume (vph)	197	1188	71	162	642	210	221	286	609	354	105	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	0.96		1.00	1.00	0.85	1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3513		1687	3342		3433	1900	1599	3502	1705	
Flt Permitted	0.27	1.00		0.07	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	508	3513		125	3342		3433	1900	1599	3502	1705	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	1291	77	176	698	228	240	311	662	385	114	190
RTOR Reduction (vph)	0	3	0	0	21	0	0	0	51	0	43	0
Lane Group Flow (vph)	214	1365	0	176	905	0	240	311	611	385	261	0
Heavy Vehicles (%)	0%	2%	0%	7%	5%	1%	2%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6					8			
Actuated Green, G (s)	63.4	50.5		84.5	65.1		12.1	21.5	49.0	14.5	23.9	
Effective Green, g (s)	63.4	50.5		84.5	65.1		12.1	21.5	49.0	14.5	23.9	
Actuated g/C Ratio	0.45	0.36		0.60	0.46		0.09	0.15	0.35	0.10	0.17	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	349	1267		382	1554		296	291	559	362	291	
v/s Ratio Prot	0.06	c0.39		0.09	0.27		0.07	0.16	c0.21	c0.11	0.15	
v/s Ratio Perm	0.22			0.19					0.17			
v/c Ratio	0.61	1.08		0.46	0.58		0.81	1.07	1.09	1.06	0.90	
Uniform Delay, d1	24.0	44.8		30.8	27.5		62.8	59.2	45.5	62.8	56.8	
Progression Factor	0.95	0.55		1.00	1.00		1.00	0.99	0.93	1.00	1.00	
Incremental Delay, d2	2.1	44.6		0.9	1.6		14.5	70.5	64.9	65.1	27.7	
Delay (s)	24.9	69.1		31.7	29.1		77.5	129.1	107.2	127.9	84.5	
Level of Service	C	E		C	C		E	F	F	F	F	
Approach Delay (s)		63.1			29.5			106.9			108.8	
Approach LOS		E			C			F			F	
Intersection Summary												
HCM 2000 Control Delay			73.5			HCM 2000 Level of Service				E		
HCM 2000 Volume to Capacity ratio			1.08									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)			26.0			
Intersection Capacity Utilization			99.2%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	542	1565	178	48	689	257	336	520	352	286	439
v/c Ratio	1.00	0.92	0.22	0.39	0.90	0.35	0.84	1.00	1.02	0.53	0.53
Control Delay	77.0	44.2	5.3	59.7	62.4	7.5	34.2	66.9	93.7	58.5	19.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.0	44.2	5.3	59.7	62.4	7.5	34.2	66.9	93.7	58.5	19.8
Queue Length 50th (ft)	~450	707	11	22	262	0	47	253	~289	128	192
Queue Length 95th (ft)	#696	#877	54	57	#423	3	#290	#370	#492	177	296
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	544	1707	809	122	763	735	409	520	346	537	821
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.92	0.22	0.39	0.90	0.35	0.82	1.00	1.02	0.53	0.53
























Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	499	1440	164	44	634	236	309	444	34	324	263	404
Future Volume (vph)	499	1440	164	44	634	236	309	444	34	324	263	404
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3574	1524	1805	3505	1599	1719	3529		1752	3406	1553
Flt Permitted	0.15	1.00	1.00	0.15	1.00	1.00	0.50	1.00		0.18	1.00	1.00
Satd. Flow (perm)	280	3574	1524	291	3505	1599	908	3529		334	3406	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	542	1565	178	48	689	257	336	483	37	352	286	439
RTOR Reduction (vph)	0	0	82	0	0	48	0	4	0	0	0	72
Lane Group Flow (vph)	542	1565	96	48	689	209	336	516	0	352	286	367
Heavy Vehicles (%)	4%	1%	6%	0%	3%	1%	5%	1%	4%	3%	6%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	65.6	65.6	65.6	30.5	30.5	54.0	42.4	20.5		45.6	22.1	61.6
Effective Green, g (s)	65.6	65.6	65.6	30.5	30.5	54.0	42.4	20.5		45.6	22.1	61.6
Actuated g/C Ratio	0.47	0.47	0.47	0.22	0.22	0.39	0.30	0.15		0.33	0.16	0.44
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	542	1674	714	110	763	690	401	516		346	537	755
v/s Ratio Prot	0.28	c0.44		0.01	c0.20	0.05	0.13	0.15		c0.17	0.08	0.14
v/s Ratio Perm	c0.19		0.06	0.08		0.08	0.12			c0.16		0.10
v/c Ratio	1.00	0.93	0.13	0.44	0.90	0.30	0.84	1.00		1.02	0.53	0.49
Uniform Delay, d1	41.0	35.2	21.1	56.9	53.3	29.9	42.6	59.7		41.6	54.2	27.9
Progression Factor	1.00	1.00	1.00	0.93	0.87	0.34	0.41	0.43		1.00	1.00	1.00
Incremental Delay, d2	38.7	11.2	0.4	2.7	15.6	0.2	13.9	39.0		52.9	3.8	0.5
Delay (s)	79.7	46.4	21.5	55.7	62.1	10.5	31.2	64.7		94.5	58.0	28.4
Level of Service	E	D	C	E	E	B	C	E		F	E	C
Approach Delay (s)		52.3			48.5			51.5			57.9	
Approach LOS		D			D			D			E	
Intersection Summary												
HCM 2000 Control Delay		52.6										
HCM 2000 Volume to Capacity ratio		1.01										
Actuated Cycle Length (s)		140.0								26.0		
Intersection Capacity Utilization		98.1%								F		
Analysis Period (min)		15										
c Critical Lane Group												

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	118	465	45	774
v/c Ratio	0.64	0.17	0.06	0.28
Control Delay	67.3	1.4	0.5	0.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	67.3	1.4	0.5	0.7
Queue Length 50th (ft)	91	18	1	5
Queue Length 95th (ft)	153	26	1	5
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	495	2753	746	2812
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.24	0.17	0.06	0.28
Intersection Summary				

HCM Signalized Intersection Capacity Analysis 5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	75	33	339	89	41	712
Future Volume (vph)	75	33	339	89	41	712
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1761		3387		1805	3471
Flt Permitted	0.97		1.00		0.48	1.00
Satd. Flow (perm)	1761		3387		921	3471
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	36	368	97	45	774
RTOR Reduction (vph)	14	0	9	0	0	0
Lane Group Flow (vph)	104	0	456	0	45	774
Heavy Vehicles (%)	0%	0%	2%	8%	0%	4%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	13.6		113.4		113.4	113.4
Effective Green, g (s)	13.6		113.4		113.4	113.4
Actuated g/C Ratio	0.10		0.81		0.81	0.81
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	171		2743		746	2811
v/s Ratio Prot	c0.06		0.13			c0.22
v/s Ratio Perm					0.05	
v/c Ratio	0.61		0.17		0.06	0.28
Uniform Delay, d1	60.6		2.9		2.7	3.3
Progression Factor	1.00		0.46		0.10	0.13
Incremental Delay, d2	5.9		0.1		0.1	0.2
Delay (s)	66.6		1.5		0.4	0.6
Level of Service	E		A		A	A
Approach Delay (s)	66.6		1.5			0.6
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	23	363	820	159	74	34
v/c Ratio	0.05	0.15	0.36	0.11	0.19	0.09
Control Delay	2.7	2.9	1.6	0.1	46.2	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.7	2.9	1.6	0.1	46.2	14.0
Queue Length 50th (ft)	2	15	7	0	55	0
Queue Length 95th (ft)	5	22	13	m0	102	30
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	482	2396	2273	1507	393	378
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.15	0.36	0.11	0.19	0.09

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↱↱	↱↱	↰	↰	↰
Traffic Volume (vph)	21	334	754	146	68	31
Future Volume (vph)	21	334	754	146	68	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3406	3505	1615	1805	1615
Flt Permitted	0.28	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	539	3406	3505	1615	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	363	820	159	74	34
RTOR Reduction (vph)	0	0	0	24	0	27
Lane Group Flow (vph)	23	363	820	135	74	7
Heavy Vehicles (%)	0%	6%	3%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	98.5	98.5	88.2	118.7	30.5	30.5
Effective Green, g (s)	98.5	98.5	88.2	118.7	30.5	30.5
Actuated g/C Ratio	0.70	0.70	0.63	0.85	0.22	0.22
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	413	2396	2208	1369	393	351
v/s Ratio Prot	0.00	c0.11	c0.23	0.02	c0.04	
v/s Ratio Perm	0.04			0.06		0.00
v/c Ratio	0.06	0.15	0.37	0.10	0.19	0.02
Uniform Delay, d1	7.2	6.9	12.5	1.8	44.7	43.0
Progression Factor	0.39	0.39	0.11	0.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	0.3	0.1	1.1	0.1
Delay (s)	2.8	2.8	1.7	0.1	45.7	43.1
Level of Service	A	A	A	A	D	D
Approach Delay (s)		2.8	1.5		44.9	
Approach LOS		A	A		D	

Intersection Summary

HCM 2000 Control Delay	5.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	34.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	26	430	977	1210	288	51
v/c Ratio	0.16	0.28	0.74	0.79	0.17	0.06
Control Delay	15.9	13.1	43.1	5.4	20.8	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.9	13.1	43.1	5.4	20.8	5.0
Queue Length 50th (ft)	7	91	426	53	74	0
Queue Length 95th (ft)	19	117	514	121	103	23
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	160	1534	1322	1533	1688	805
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.28	0.74	0.79	0.17	0.06

Intersection Summary

HCM Signalized Intersection Capacity Analysis

11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	24	396	899	1113	265	47
Future Volume (vph)	24	396	899	1113	265	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1671	3610	3539	1599	3502	1615
Flt Permitted	0.14	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	244	3610	3539	1599	3502	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	430	977	1210	288	51
RTOR Reduction (vph)	0	0	0	126	0	26
Lane Group Flow (vph)	26	430	977	1084	288	25
Heavy Vehicles (%)	8%	0%	2%	1%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	59.5	59.5	49.7	117.2	67.5	67.5
Effective Green, g (s)	59.5	59.5	49.7	117.2	67.5	67.5
Actuated g/C Ratio	0.42	0.42	0.36	0.84	0.48	0.48
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	137	1534	1256	1412	1688	778
v/s Ratio Prot	0.00	c0.12	0.28	c0.37	0.08	
v/s Ratio Perm	0.08			0.31		0.02
v/c Ratio	0.19	0.28	0.78	0.77	0.17	0.03
Uniform Delay, d1	45.6	26.3	40.2	5.2	20.5	19.1
Progression Factor	0.49	0.48	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.5	4.8	4.1	0.2	0.1
Delay (s)	22.9	13.0	45.0	9.3	20.7	19.1
Level of Service	C	B	D	A	C	B
Approach Delay (s)		13.6	25.2		20.4	
Approach LOS		B	C		C	

Intersection Summary

HCM 2000 Control Delay	22.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Concord Rd & Site Access

10/27/2020



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	30	34	9	14	66	1286	11	350	16
v/c Ratio	0.37	0.27	0.10	0.13	0.07	0.40	0.03	0.21	0.01
Control Delay	74.9	23.9	63.4	28.0	1.5	2.0	2.0	1.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.0	23.9	63.4	28.0	1.5	2.0	2.0	1.7	0.0
Queue Length 50th (ft)	27	0	8	0	6	81	1	37	0
Queue Length 95th (ft)	61	36	27	23	14	125	m2	m56	m0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	241	310	255	294	939	3186	350	1687	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	9	0	0	11	0	24	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.11	0.04	0.05	0.07	0.41	0.03	0.21	0.01

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↖	↗		↖	↗	↖	↗		↖	↗	↗
Traffic Volume (vph)	27	1	31	6	2	13	61	1125	58	10	322	15
Future Volume (vph)	27	1	31	6	2	13	61	1125	58	10	322	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1812	1615		1829	1615	1805	3550		1805	1881	1615
Flt Permitted		0.73	1.00		0.77	1.00	0.55	1.00		0.21	1.00	1.00
Satd. Flow (perm)		1381	1615		1460	1615	1047	3550		392	1881	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	1	34	7	2	14	66	1223	63	11	350	16
RTOR Reduction (vph)	0	0	32	0	0	13	0	1	0	0	0	0
Lane Group Flow (vph)	0	30	2	0	9	1	66	1285	0	11	350	16
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		7.2	7.2		7.2	7.2	123.8	123.8		123.8	123.8	131.0
Effective Green, g (s)		7.2	7.2		7.2	7.2	123.8	123.8		123.8	123.8	131.0
Actuated g/C Ratio		0.05	0.05		0.05	0.05	0.88	0.88		0.88	0.88	0.94
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		71	83		75	83	925	3139		346	1663	1615
v/s Ratio Prot								c0.36			0.19	0.00
v/s Ratio Perm		c0.02	0.00		0.01	0.00	0.06			0.03		0.01
v/c Ratio		0.42	0.02		0.12	0.01	0.07	0.41		0.03	0.21	0.01
Uniform Delay, d1		64.4	63.1		63.4	63.0	1.0	1.5		1.0	1.2	0.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.32	1.14	1.00
Incremental Delay, d2		4.0	0.1		0.7	0.0	0.1	0.4		0.1	0.2	0.0
Delay (s)		68.4	63.2		64.1	63.1	1.1	1.9		1.4	1.5	0.3
Level of Service		E	E		E	E	A	A		A	A	A
Approach Delay (s)		65.6			63.5			1.8			1.5	
Approach LOS		E			E			A			A	

Intersection Summary

HCM 2000 Control Delay	4.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	310	1620	46	1146	131	245
v/c Ratio	0.82	0.76	0.31	0.74	0.30	0.76
Control Delay	56.4	7.0	14.1	23.9	42.5	59.3
Queue Delay	0.0	0.4	0.0	0.0	0.0	0.0
Total Delay	56.4	7.5	14.1	23.9	42.5	59.3
Queue Length 50th (ft)	178	195	10	286	91	186
Queue Length 95th (ft)	260	93	m16	351	152	#311
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	447	2137	148	1552	434	324
Starvation Cap Reductn	0	163	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.82	0.31	0.74	0.30	0.76

Intersection Summary



















95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 18: Kingston Pike & Lendon Welsch Way

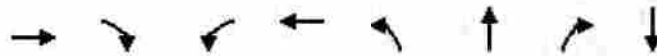
10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	1458	32	42	846	208	9	85	27	111	9	105
Future Volume (vph)	285	1458	32	42	846	208	9	85	27	111	9	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	0.97			0.97			0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1687	3563		1805	3375			1836			1698	
Flt Permitted	0.11	1.00		0.09	1.00			0.97			0.73	
Satd. Flow (perm)	200	3563		171	3375			1784			1267	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	1585	35	46	920	226	10	92	29	121	10	114
RTOR Reduction (vph)	0	1	0	0	14	0	0	8	0	0	22	0
Lane Group Flow (vph)	310	1619	0	46	1132	0	0	123	0	0	223	0
Heavy Vehicles (%)	7%	1%	0%	0%	4%	3%	0%	0%	0%	1%	0%	4%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	93.5	82.6		68.3	63.9			33.5			33.5	
Effective Green, g (s)	93.5	82.6		68.3	63.9			33.5			33.5	
Actuated g/C Ratio	0.67	0.59		0.49	0.46			0.24			0.24	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	378	2102		134	1540			426			303	
v/s Ratio Prot	c0.13	c0.45		0.01	0.34							
v/s Ratio Perm	c0.41			0.16				0.07			c0.18	
v/c Ratio	0.82	0.77		0.34	0.73			0.29			0.74	
Uniform Delay, d1	32.6	21.6		21.8	31.1			43.5			49.2	
Progression Factor	1.69	0.24		0.77	0.67			1.00			1.00	
Incremental Delay, d2	9.5	1.9		1.2	2.4			1.7			9.0	
Delay (s)	64.6	7.2		18.0	23.3			45.2			58.1	
Level of Service	E	A		B	C			D			E	
Approach Delay (s)		16.4			23.1			45.2			58.1	
Approach LOS		B			C			D			E	
Intersection Summary												
HCM 2000 Control Delay	22.7			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.82											
Actuated Cycle Length (s)	140.0			Sum of lost time (s)			19.5					
Intersection Capacity Utilization	81.8%			ICU Level of Service			D					
Analysis Period (min)	15											
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	1773	27	126	907	101	1	183	3
v/c Ratio	0.73	0.02	0.80	0.34	0.43	0.01	0.51	0.04
Control Delay	5.4	0.0	48.9	2.0	67.9	59.0	10.3	57.7
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	5.4	0.0	48.9	2.1	67.9	59.0	10.3	57.7
Queue Length 50th (ft)	148	0	59	46	46	1	0	2
Queue Length 95th (ft)	m196	m0	m#115	60	76	7	52	13
Internal Link Dist (ft)	937			449		417		100
Turn Bay Length (ft)		100	125		200		200	
Base Capacity (vph)	2421	1203	158	2693	462	251	360	236
Starvation Cap Reductn	0	0	0	604	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.02	0.80	0.43	0.22	0.00	0.51	0.01

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.























Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

22: Brooklawn St & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1631	25	116	831	4	93	1	168	1	1	1
Future Volume (vph)	0	1631	25	116	831	4	93	1	168	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97	1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.95	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (prot)		3539	1615	1805	3499		3502	1900	1599		1785	
Flt Permitted		1.00	1.00	0.06	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (perm)		3539	1615	119	3499		3502	1900	1599		1785	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1773	27	126	903	4	101	1	183	1	1	1
RTOR Reduction (vph)	0	0	9	0	0	0	0	0	164	0	1	0
Lane Group Flow (vph)	0	1773	18	126	907	0	101	1	19	0	2	0
Heavy Vehicles (%)	0%	2%	0%	0%	3%	25%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)		88.0	91.3	100.0	100.0		9.4	9.4	14.9		1.3	
Effective Green, g (s)		88.0	91.3	100.0	100.0		9.4	9.4	14.9		1.3	
Actuated g/C Ratio		0.63	0.65	0.71	0.71		0.07	0.07	0.11		0.01	
Clearance Time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)		2224	1053	151	2499		235	127	170		16	
v/s Ratio Prot		0.50	c0.00	c0.03	0.26		c0.03	0.00	0.00		c0.00	
v/s Ratio Perm			0.01	c0.56					0.01			
v/c Ratio		0.80	0.02	0.83	0.36		0.43	0.01	0.11		0.13	
Uniform Delay, d1		19.4	8.6	43.7	7.7		62.7	60.9	56.6		68.8	
Progression Factor		0.26	1.00	0.73	0.29		1.00	1.00	1.00		1.00	
Incremental Delay, d2		1.1	0.0	22.3	0.3		1.3	0.0	0.3		3.5	
Delay (s)		6.1	8.6	54.3	2.5		64.0	61.0	56.9		72.3	
Level of Service		A	A	D	A		E	E	E		E	
Approach Delay (s)		6.2			8.8			59.4			72.3	
Approach LOS		A			A			E			E	
Intersection Summary												
HCM 2000 Control Delay			12.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			140.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			75.9%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	214	1368	176	926	240	311	662	385	304
v/c Ratio	0.67	0.94	0.87	0.69	0.58	0.91	0.85	0.91	0.86
Control Delay	24.8	27.3	69.8	34.9	59.1	79.9	33.5	83.3	64.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.8	27.3	69.8	34.9	59.1	79.9	33.5	83.3	64.2
Queue Length 50th (ft)	38	454	98	323	102	254	117	168	203
Queue Length 95th (ft)	m81	#716	#239	423	#168	#421	#182	#262	#310
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	372	1455	204	1346	413	343	783	421	406
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.94	0.86	0.69	0.58	0.91	0.85	0.91	0.75

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.












Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	197	1188	71	162	642	210	221	286	609	354	105	175
Future Volume (vph)	197	1188	71	162	642	210	221	286	609	354	105	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	0.88	0.97	1.00	
Frt	1.00	0.99		1.00	0.96		1.00	1.00	0.85	1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3513		1687	3342		3433	1900	2814	3502	1705	
Flt Permitted	0.17	1.00		0.08	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	315	3513		138	3342		3433	1900	2814	3502	1705	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	214	1291	77	176	698	228	240	311	662	385	114	190
RTOR Reduction (vph)	0	4	0	0	23	0	0	0	275	0	48	0
Lane Group Flow (vph)	214	1364	0	176	903	0	240	311	387	385	256	0
Heavy Vehicles (%)	0%	2%	0%	7%	5%	1%	2%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	Prot	Prot	NA	
Protected Phases	5	2		1	6		3	8	8	7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	67.2	53.7		62.8	51.5		15.7	23.3	23.3	15.7	23.3	
Effective Green, g (s)	67.2	53.7		62.8	51.5		15.7	23.3	23.3	15.7	23.3	
Actuated g/C Ratio	0.52	0.41		0.48	0.40		0.12	0.18	0.18	0.12	0.18	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	317	1451		201	1323		414	340	504	422	305	
v/s Ratio Prot	0.07	c0.39		c0.08	0.27		0.07	c0.16	0.14	c0.11	0.15	
v/s Ratio Perm	0.28			0.35								
v/c Ratio	0.68	0.94		0.88	0.68		0.58	0.91	0.77	0.91	0.84	
Uniform Delay, d1	20.9	36.6		34.6	32.5		54.0	52.4	50.8	56.5	51.5	
Progression Factor	1.16	0.48		1.00	1.00		0.96	0.95	0.90	1.00	1.00	
Incremental Delay, d2	3.5	9.1		31.8	2.9		1.8	26.8	6.5	23.7	17.8	
Delay (s)	27.9	26.5		66.5	35.4		53.9	76.7	52.3	80.2	69.4	
Level of Service	C	C		E	D		D	E	D	F	E	
Approach Delay (s)		26.6			40.3			58.9			75.4	
Approach LOS		C			D			E			E	
Intersection Summary												
HCM 2000 Control Delay			45.8			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			26.0			
Intersection Capacity Utilization			90.9%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	542	1565	178	48	689	257	336	520	352	286	439
v/c Ratio	0.69	0.85	0.20	0.36	0.50	0.29	0.57	0.88	0.81	0.49	0.66
Control Delay	23.9	33.6	3.0	46.1	31.4	5.2	11.9	39.3	50.4	51.7	27.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.9	33.6	3.0	46.1	31.4	5.2	11.9	39.3	50.4	51.7	27.5
Queue Length 50th (ft)	137	605	0	22	170	0	22	228	117	115	214
Queue Length 95th (ft)	177	717	38	49	219	0	31	#308	#169	162	308
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	911	1839	870	133	1369	897	593	589	437	589	731
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.85	0.20	0.36	0.50	0.29	0.57	0.88	0.81	0.49	0.60

























Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

3: S Campbell Station Rd/N Campbell Station Rd & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	499	1440	164	44	634	236	309	444	34	324	263	404
Future Volume (vph)	499	1440	164	44	634	236	309	444	34	324	263	404
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3367	3574	1524	1805	3505	1599	3335	3529		3400	3406	1553
Flt Permitted	0.22	1.00	1.00	0.09	1.00	1.00	0.51	1.00		0.18	1.00	1.00
Satd. Flow (perm)	786	3574	1524	164	3505	1599	1798	3529		636	3406	1553
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	542	1565	178	48	689	257	336	483	37	352	286	439
RTOR Reduction (vph)	0	0	88	0	0	43	0	4	0	0	0	94
Lane Group Flow (vph)	542	1565	90	48	689	214	336	516	0	352	286	345
Heavy Vehicles (%)	4%	1%	6%	0%	3%	1%	5%	1%	4%	3%	6%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	65.6	65.6	65.6	50.8	50.8	63.2	33.1	21.6		34.9	22.5	41.7
Effective Green, g (s)	65.6	65.6	65.6	50.8	50.8	63.2	33.1	21.6		34.9	22.5	41.7
Actuated g/C Ratio	0.50	0.50	0.50	0.39	0.39	0.49	0.25	0.17		0.27	0.17	0.32
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	777	1803	769	119	1369	857	593	586		434	589	575
v/s Ratio Prot	0.10	c0.44		0.01	c0.20	0.02	0.05	c0.15		c0.08	0.08	0.09
v/s Ratio Perm	0.25		0.06	0.14		0.11	0.09			0.14		0.13
v/c Ratio	0.70	0.87	0.12	0.40	0.50	0.25	0.57	0.88		0.81	0.49	0.60
Uniform Delay, d1	21.5	28.4	17.0	46.6	30.0	19.5	40.2	52.9		39.7	48.5	37.1
Progression Factor	1.00	1.00	1.00	0.92	0.97	0.38	0.23	0.40		1.00	1.00	1.00
Incremental Delay, d2	2.7	6.0	0.3	2.1	1.3	0.1	1.2	16.8		11.0	2.8	1.8
Delay (s)	24.3	34.3	17.3	45.3	30.4	7.5	10.4	38.0		50.7	51.4	38.9
Level of Service	C	C	B	D	C	A	B	D		D	D	D
Approach Delay (s)		30.6			25.2			27.2			46.1	
Approach LOS		C			C			C			D	

Intersection Summary

HCM 2000 Control Delay	32.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	118	465	45	774
v/c Ratio	0.62	0.17	0.06	0.28
Control Delay	61.5	1.5	0.4	0.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	61.5	1.5	0.4	0.5
Queue Length 50th (ft)	83	21	1	5
Queue Length 95th (ft)	142	23	1	5
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	506	2722	738	2778
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.23	0.17	0.06	0.28
Intersection Summary				

HCM Signalized Intersection Capacity Analysis 5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	75	33	339	89	41	712
Future Volume (vph)	75	33	339	89	41	712
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1761		3387		1805	3471
Flt Permitted	0.97		1.00		0.48	1.00
Satd. Flow (perm)	1761		3387		921	3471
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	36	368	97	45	774
RTOR Reduction (vph)	15	0	10	0	0	0
Lane Group Flow (vph)	103	0	455	0	45	774
Heavy Vehicles (%)	0%	0%	2%	8%	0%	4%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	12.9		104.1		104.1	104.1
Effective Green, g (s)	12.9		104.1		104.1	104.1
Actuated g/C Ratio	0.10		0.80		0.80	0.80
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	174		2712		737	2779
v/s Ratio Prot	c0.06		0.13			c0.22
v/s Ratio Perm					0.05	
v/c Ratio	0.59		0.17		0.06	0.28
Uniform Delay, d1	56.0		3.0		2.7	3.3
Progression Factor	1.00		0.48		0.07	0.07
Incremental Delay, d2	5.3		0.1		0.2	0.2
Delay (s)	61.3		1.5		0.3	0.5
Level of Service	E		A		A	A
Approach Delay (s)	61.3		1.5			0.5
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	5.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	23	363	820	159	74	34
v/c Ratio	0.05	0.15	0.37	0.11	0.19	0.09
Control Delay	3.2	3.1	1.7	0.1	42.9	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.2	3.1	1.7	0.1	42.9	13.2
Queue Length 50th (ft)	2	19	6	0	51	0
Queue Length 95th (ft)	6	26	12	m0	95	29
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	473	2371	2232	1498	395	380
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.15	0.37	0.11	0.19	0.09

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	334	754	146	68	31
Future Volume (vph)	21	334	754	146	68	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3406	3505	1615	1805	1615
Flt Permitted	0.28	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	533	3406	3505	1615	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	363	820	159	74	34
RTOR Reduction (vph)	0	0	0	26	0	27
Lane Group Flow (vph)	23	363	820	133	74	7
Heavy Vehicles (%)	0%	6%	3%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	90.5	90.5	80.2	108.7	28.5	28.5
Effective Green, g (s)	90.5	90.5	80.2	108.7	28.5	28.5
Actuated g/C Ratio	0.70	0.70	0.62	0.84	0.22	0.22
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	408	2371	2162	1350	395	354
v/s Ratio Prot	0.00	c0.11	c0.23	0.02	c0.04	
v/s Ratio Perm	0.04			0.06		0.00
v/c Ratio	0.06	0.15	0.38	0.10	0.19	0.02
Uniform Delay, d1	7.1	6.7	12.5	1.9	41.3	39.8
Progression Factor	0.48	0.44	0.12	0.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	0.4	0.1	1.0	0.1
Delay (s)	3.5	3.1	1.8	0.1	42.4	39.9
Level of Service	A	A	A	A	D	D
Approach Delay (s)		3.1	1.5		41.6	
Approach LOS		A	A		D	
Intersection Summary						
HCM 2000 Control Delay			4.9		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.33			
Actuated Cycle Length (s)			130.0		Sum of lost time (s)	17.5
Intersection Capacity Utilization			34.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	26	430	977	1210	288	51
v/c Ratio	0.16	0.28	0.74	0.79	0.17	0.06
Control Delay	13.9	11.0	40.7	5.6	20.0	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.9	11.0	40.7	5.6	20.0	5.1
Queue Length 50th (ft)	7	57	396	51	70	0
Queue Length 95th (ft)	16	75	484	124	98	23
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	165	1541	1314	1529	1656	790
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.28	0.74	0.79	0.17	0.06
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	24	396	899	1113	265	47
Future Volume (vph)	24	396	899	1113	265	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1671	3610	3539	1599	3502	1615
Flt Permitted	0.14	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	247	3610	3539	1599	3502	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	430	977	1210	288	51
RTOR Reduction (vph)	0	0	0	137	0	27
Lane Group Flow (vph)	26	430	977	1073	288	24
Heavy Vehicles (%)	8%	0%	2%	1%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	55.5	55.5	45.7	107.2	61.5	61.5
Effective Green, g (s)	55.5	55.5	45.7	107.2	61.5	61.5
Actuated g/C Ratio	0.43	0.43	0.35	0.82	0.47	0.47
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	141	1541	1244	1398	1656	764
v/s Ratio Prot	0.00	c0.12	0.28	c0.36	0.08	
v/s Ratio Perm	0.07			0.31		0.01
v/c Ratio	0.18	0.28	0.79	0.77	0.17	0.03
Uniform Delay, d1	41.9	24.2	37.8	5.4	19.7	18.3
Progression Factor	0.46	0.43	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.4	5.0	4.1	0.2	0.1
Delay (s)	19.7	10.9	42.8	9.5	19.9	18.4
Level of Service	B	B	D	A	B	B
Approach Delay (s)		11.4	24.4		19.7	
Approach LOS		B	C		B	

Intersection Summary

HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Concord Rd & Site Access

10/27/2020



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	30	34	9	14	66	1286	11	350	16
v/c Ratio	0.35	0.26	0.10	0.12	0.07	0.41	0.03	0.21	0.01
Control Delay	68.6	22.2	58.4	26.2	1.5	2.1	1.5	1.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.6	22.2	58.4	26.2	1.5	2.1	1.5	1.5	0.0
Queue Length 50th (ft)	25	0	7	0	5	80	1	32	0
Queue Length 95th (ft)	57	34	26	22	14	123	m1	m46	m0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	260	331	274	315	932	3163	348	1675	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.10	0.03	0.04	0.07	0.41	0.03	0.21	0.01























Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	1	31	6	2	13	61	1125	58	10	322	15
Future Volume (vph)	27	1	31	6	2	13	61	1125	58	10	322	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1812	1615		1829	1615	1805	3550		1805	1881	1615
Flt Permitted		0.73	1.00		0.77	1.00	0.55	1.00		0.21	1.00	1.00
Satd. Flow (perm)		1381	1615		1457	1615	1047	3550		391	1881	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	1	34	7	2	14	66	1223	63	11	350	16
RTOR Reduction (vph)	0	0	32	0	0	13	0	1	0	0	0	0
Lane Group Flow (vph)	0	30	2	0	9	1	66	1285	0	11	350	16
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		7.0	7.0		7.0	7.0	114.0	114.0		114.0	114.0	121.0
Effective Green, g (s)		7.0	7.0		7.0	7.0	114.0	114.0		114.0	114.0	121.0
Actuated g/C Ratio		0.05	0.05		0.05	0.05	0.88	0.88		0.88	0.88	0.93
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		74	86		78	86	918	3113		342	1649	1615
v/s Ratio Prot								c0.36			0.19	0.00
v/s Ratio Perm		c0.02	0.00		0.01	0.00	0.06			0.03		0.01
v/c Ratio		0.41	0.02		0.12	0.01	0.07	0.41		0.03	0.21	0.01
Uniform Delay, d1		59.5	58.3		58.6	58.2	1.1	1.5		1.0	1.2	0.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.93	0.94	1.00
Incremental Delay, d2		3.6	0.1		0.7	0.0	0.2	0.4		0.1	0.2	0.0
Delay (s)		63.1	58.4		59.2	58.3	1.2	1.9		1.0	1.3	0.3
Level of Service		E	E		E	E	A	A		A	A	A
Approach Delay (s)		60.6			58.6			1.9			1.3	
Approach LOS		E			E			A			A	

Intersection Summary

HCM 2000 Control Delay	4.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	310	1620	46	1146	131	245
v/c Ratio	0.83	0.78	0.32	0.77	0.30	0.73
Control Delay	54.7	7.2	16.8	27.5	39.3	53.3
Queue Delay	0.0	0.5	0.0	0.0	0.0	0.0
Total Delay	54.7	7.7	16.8	27.5	39.3	53.3
Queue Length 50th (ft)	152	221	9	266	83	167
Queue Length 95th (ft)	m260	81	m20	393	143	#283
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	428	2082	146	1497	439	335
Starvation Cap Reductn	0	146	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.84	0.32	0.77	0.30	0.73

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.






Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

18: Kingston Pike & Lendon Welsch Way

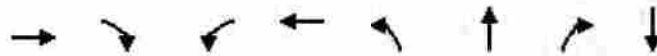
10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	1458	32	42	846	208	9	85	27	111	9	105
Future Volume (vph)	285	1458	32	42	846	208	9	85	27	111	9	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	0.97			0.97			0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1687	3563		1805	3375			1836			1698	
Flt Permitted	0.10	1.00		0.08	1.00			0.97			0.74	
Satd. Flow (perm)	186	3563		160	3375			1784			1286	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	1585	35	46	920	226	10	92	29	121	10	114
RTOR Reduction (vph)	0	1	0	0	16	0	0	8	0	0	24	0
Lane Group Flow (vph)	310	1619	0	46	1130	0	0	123	0	0	221	0
Heavy Vehicles (%)	7%	1%	0%	0%	4%	3%	0%	0%	0%	1%	0%	4%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	85.5	74.6		61.5	57.1			31.5			31.5	
Effective Green, g (s)	85.5	74.6		61.5	57.1			31.5			31.5	
Actuated g/C Ratio	0.66	0.57		0.47	0.44			0.24			0.24	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	375	2044		131	1482			432			311	
v/s Ratio Prot	c0.14	c0.45		0.01	0.33							
v/s Ratio Perm	c0.40			0.15				0.07			c0.17	
v/c Ratio	0.83	0.79		0.35	0.76			0.29			0.71	
Uniform Delay, d1	32.2	21.6		21.6	30.7			40.1			45.1	
Progression Factor	1.57	0.24		0.97	0.78			1.00			1.00	
Incremental Delay, d2	9.6	2.2		1.2	2.9			1.7			7.2	
Delay (s)	60.3	7.4		22.1	27.0			41.7			52.3	
Level of Service	E	A		C	C			D			D	
Approach Delay (s)		15.9			26.8			41.7			52.3	
Approach LOS		B			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			23.1			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			19.5			
Intersection Capacity Utilization			81.8%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	1773	27	126	907	101	1	183	3
v/c Ratio	0.76	0.02	0.84	0.34	0.41	0.01	0.49	0.04
Control Delay	9.8	0.0	52.2	2.4	62.5	55.0	9.4	53.3
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	9.8	0.0	52.2	2.5	62.5	55.0	9.4	53.3
Queue Length 50th (ft)	187	0	49	47	42	1	0	2
Queue Length 95th (ft)	#898	m0	m#114	63	71	7	48	12
Internal Link Dist (ft)	937			449		417		100
Turn Bay Length (ft)		100	125		200		200	
Base Capacity (vph)	2344	1178	150	2640	498	270	370	254
Starvation Cap Reductn	0	0	0	552	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.02	0.84	0.43	0.20	0.00	0.49	0.01

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.























Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

22: Brooklawn St & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1631	25	116	831	4	93	1	168	1	1	1
Future Volume (vph)	0	1631	25	116	831	4	93	1	168	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Lane Util. Factor		0.95	1.00	1.00	0.95		0.97	1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.95	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (prot)		3539	1615	1805	3499		3502	1900	1599		1785	
Flt Permitted		1.00	1.00	0.06	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (perm)		3539	1615	105	3499		3502	1900	1599		1785	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1773	27	126	903	4	101	1	183	1	1	1
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	162	0	1	0
Lane Group Flow (vph)	0	1773	17	126	907	0	101	1	21	0	2	0
Heavy Vehicles (%)	0%	2%	0%	0%	3%	25%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)		78.3	81.6	90.3	90.3		9.1	9.1	14.6		1.3	
Effective Green, g (s)		78.3	81.6	90.3	90.3		9.1	9.1	14.6		1.3	
Actuated g/C Ratio		0.60	0.63	0.69	0.69		0.07	0.07	0.11		0.01	
Clearance Time (s)		6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)		2131	1013	144	2430		245	133	179		17	
v/s Ratio Prot		0.50	c0.00	c0.04	0.26		c0.03	0.00	0.00		c0.00	
v/s Ratio Perm			0.01	c0.57					0.01			
v/c Ratio		0.83	0.02	0.88	0.37		0.41	0.01	0.11		0.12	
Uniform Delay, d1		20.6	9.1	43.5	8.2		57.9	56.2	51.9		63.8	
Progression Factor		0.45	1.00	0.58	0.33		1.00	1.00	1.00		1.00	
Incremental Delay, d2		2.1	0.0	29.0	0.3		1.1	0.0	0.3		3.1	
Delay (s)		11.3	9.1	54.4	3.0		59.0	56.3	52.2		66.9	
Level of Service		B	A	D	A		E	E	D		E	
Approach Delay (s)		11.3			9.2			54.6			66.9	
Approach LOS		B			A			D			E	
Intersection Summary												
HCM 2000 Control Delay			14.6			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			75.9%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM 6th TWSC
9: Brooklawn St & Pinnacle Access

10/27/2020

Intersection

Int Delay, s/veh 3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Vol, veh/h	0	0	32	30	0	10	56	112	6	3	80	3
Future Vol, veh/h	0	0	32	30	0	10	56	112	6	3	80	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	75	-	-	70	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	35	33	0	11	61	122	7	3	87	3







Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	348	346	89	360	344	126	90	0	0	129	0	0
Stage 1	95	95	-	248	248	-	-	-	-	-	-	-
Stage 2	253	251	-	112	96	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	607	577	969	596	579	924	1505	-	-	1457	-	-
Stage 1	912	816	-	756	701	-	-	-	-	-	-	-
Stage 2	751	699	-	893	815	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	580	552	969	556	554	924	1505	-	-	1457	-	-
Mov Cap-2 Maneuver	580	552	-	556	554	-	-	-	-	-	-	-
Stage 1	875	814	-	725	672	-	-	-	-	-	-	-
Stage 2	712	670	-	859	813	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	11.3	2.4	0.3
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1505	-	-	969	617	1457	-
HCM Lane V/C Ratio	0.04	-	-	0.036	0.07	0.002	-
HCM Control Delay (s)	7.5	-	-	8.9	11.3	7.5	-
HCM Lane LOS	A	-	-	A	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.2	0	-

Intersection

Int Delay, s/veh 4.1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	40	75	35	10	77	66	56	3	2	29	2	30
Future Vol, veh/h	40	75	35	10	77	66	56	3	2	29	2	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	43	82	38	11	84	72	61	3	2	32	2	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	156	0	0	120	0	0	347	365	101	332	348	120
Stage 1	-	-	-	-	-	-	187	187	-	142	142	-
Stage 2	-	-	-	-	-	-	160	178	-	190	206	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1424	-	-	1468	-	-	607	563	954	621	576	931
Stage 1	-	-	-	-	-	-	815	745	-	861	779	-
Stage 2	-	-	-	-	-	-	842	752	-	812	731	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1424	-	-	1468	-	-	568	542	954	599	555	931
Mov Cap-2 Maneuver	-	-	-	-	-	-	568	542	-	599	555	-
Stage 1	-	-	-	-	-	-	791	723	-	835	774	-
Stage 2	-	-	-	-	-	-	804	747	-	782	709	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	2	0.5	12.1	10.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	574	1468	-	-	1424	-	724
HCM Lane V/C Ratio	0.116	0.007	-	-	0.031	-	0.092
HCM Control Delay (s)	12.1	7.5	-	-	7.6	-	10.5
HCM Lane LOS	B	A	-	-	A	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	0.3

HCM 6th Roundabout
26: Brooklawn St & Kroger Roundabout

10/27/2020

Intersection			
Intersection Delay, s/veh	3.4		
Intersection LOS	A		
Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	12	132	109
Demand Flow Rate, veh/h	12	135	111
Vehicles Circulating, veh/h	89	3	4
Vehicles Exiting, veh/h	26	98	134
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	2.9	3.4	3.3
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	12	135	111
Cap Entry Lane, veh/h	1260	1376	1374
Entry HV Adj Factor	1.000	0.981	0.984
Flow Entry, veh/h	12	132	109
Cap Entry, veh/h	1260	1349	1353
V/C Ratio	0.010	0.098	0.081
Control Delay, s/veh	2.9	3.4	3.3
LOS	A	A	A
95th %tile Queue, veh	0	0	0

Intersection

Int Delay, s/veh 1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗	↖		↗	↖
Traffic Vol, veh/h	0	32	121	0	11	101
Future Vol, veh/h	0	32	121	0	11	101
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	35	132	0	12	110

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	-	132	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.22	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.318	-
Pot Cap-1 Maneuver	0	917	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	917	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	0.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBTWBLn1	SBL	SBT
Capacity (veh/h)	-	917	1453
HCM Lane V/C Ratio	-	0.038	0.008
HCM Control Delay (s)	-	9.1	7.5
HCM Lane LOS	-	A	A
HCM 95th %tile Q(veh)	-	0.1	0

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	50	1290	502	1746	153	78	376	126	152
v/c Ratio	0.36	1.01	0.98	0.83	0.64	0.51	0.67	0.31	0.70
Control Delay	18.5	44.1	73.6	26.8	71.5	67.8	27.6	57.0	60.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.5	44.1	73.6	26.8	71.5	67.8	27.6	57.0	60.2
Queue Length 50th (ft)	7	~453	~399	638	64	64	142	51	97
Queue Length 95th (ft)	m17	#720	#619	759	#136	114	220	87	167
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	138	1281	512	2096	239	259	563	401	277
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	1.01	0.98	0.83	0.64	0.30	0.67	0.31	0.55

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱	↱	↰	↱	
Traffic Volume (vph)	46	1139	48	462	1515	91	141	72	346	116	68	72
Future Volume (vph)	46	1139	48	462	1515	91	141	72	346	116	68	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	1.00	0.97	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3501		1770	3509		3335	1827	1538	3502	1745	
Flt Permitted	0.09	1.00		0.08	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	165	3501		141	3509		3335	1827	1538	3502	1745	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	1238	52	502	1647	99	153	78	376	126	74	78
RTOR Reduction (vph)	0	3	0	0	3	0	0	0	56	0	30	0
Lane Group Flow (vph)	50	1287	0	502	1743	0	153	78	320	126	122	0
Heavy Vehicles (%)	0%	2%	14%	2%	2%	2%	5%	4%	5%	0%	1%	0%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6					8			
Actuated Green, G (s)	50.7	46.2		86.0	75.0		10.6	9.6	42.9	14.9	13.9	
Effective Green, g (s)	50.7	46.2		86.0	75.0		10.6	9.6	42.9	14.9	13.9	
Actuated g/C Ratio	0.39	0.36		0.66	0.58		0.08	0.07	0.33	0.11	0.11	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	121	1244		510	2024		271	134	507	401	186	
v/s Ratio Prot	0.01	0.37		c0.25	0.50		c0.05	0.04	0.16	c0.04	c0.07	
v/s Ratio Perm	0.15			c0.40					0.05			
v/c Ratio	0.41	1.03		0.98	0.86		0.56	0.58	0.63	0.31	0.65	
Uniform Delay, d1	27.1	41.9		40.9	23.1		57.5	58.3	36.8	52.9	55.7	
Progression Factor	0.82	0.44		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.8	32.2		35.5	5.1		2.7	6.3	2.6	0.5	8.0	
Delay (s)	24.0	50.8		76.5	28.2		60.2	64.6	39.4	53.3	63.7	
Level of Service	C	D		E	C		E	E	D	D	E	
Approach Delay (s)		49.8			39.0			47.9			59.0	
Approach LOS		D			D			D			E	
Intersection Summary												
HCM 2000 Control Delay			44.7			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			26.0			
Intersection Capacity Utilization			92.4%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

3: Kingston Pike & N Campbell Station Rd

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	487	1034	413	93	1376	542	384	523	472	715	701
v/c Ratio	1.39	0.68	0.45	0.37	1.19	0.66	1.45	1.04	1.29	1.03	0.96
Control Delay	224.3	33.1	3.8	26.5	120.9	13.7	246.2	76.4	192.6	92.9	54.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	224.3	33.1	3.8	26.5	120.9	13.7	246.2	76.4	192.6	92.9	54.6
Queue Length 50th (ft)	~498	365	0	44	~731	101	~446	~247	~506	~338	485
Queue Length 95th (ft)	#717	444	60	m38	#860	450	#622	#344	#720	#464	#754
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	350	1510	912	250	1156	821	265	502	365	694	732
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.39	0.68	0.45	0.37	1.19	0.66	1.45	1.04	1.29	1.03	0.96

























Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

3: Kingston Pike & N Campbell Station Rd

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	448	951	380	86	1266	499	353	412	69	434	658	645
Future Volume (vph)	448	951	380	86	1266	499	353	412	69	434	658	645
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3463		1770	3539	1583
Flt Permitted	0.12	1.00	1.00	0.28	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Satd. Flow (perm)	219	3539	1583	516	3539	1583	1863	3463		1863	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	487	1034	413	93	1376	542	384	448	75	472	715	701
RTOR Reduction (vph)	0	0	237	0	0	43	0	10	0	0	0	88
Lane Group Flow (vph)	487	1034	176	93	1376	499	384	513	0	472	715	613
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	55.5	55.5	55.5	42.5	42.5	64.0	18.5	18.5		25.5	25.5	47.0
Effective Green, g (s)	55.5	55.5	55.5	42.5	42.5	64.0	18.5	18.5		25.5	25.5	47.0
Actuated g/C Ratio	0.43	0.43	0.43	0.33	0.33	0.49	0.14	0.14		0.20	0.20	0.36
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	350	1510	675	250	1156	779	265	492		365	694	651
v/s Ratio Prot	c0.23	0.29		0.02	c0.39	0.11	0.16	0.15		0.21	0.20	0.16
v/s Ratio Perm	c0.36		0.11	0.10		0.21	c0.05			c0.05		0.23
v/c Ratio	1.39	0.68	0.26	0.37	1.19	0.64	1.45	1.04		1.29	1.03	0.94
Uniform Delay, d1	40.0	30.2	24.0	35.9	43.8	24.5	56.2	55.8		51.4	52.2	40.2
Progression Factor	1.00	1.00	1.00	0.63	0.69	1.04	0.44	0.42		1.00	1.00	1.00
Incremental Delay, d2	192.8	2.5	0.9	0.6	91.5	1.2	221.5	51.3		150.9	42.1	21.9
Delay (s)	232.8	32.7	25.0	23.1	121.7	26.5	246.4	74.7		202.3	94.4	62.1
Level of Service	F	C	C	C	F	C	F	E		F	F	E
Approach Delay (s)		81.4			91.5			147.4			109.4	
Approach LOS		F			F			F			F	
Intersection Summary												
HCM 2000 Control Delay			101.1			HCM 2000 Level of Service		F				
HCM 2000 Volume to Capacity ratio			1.40									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)		26.0				
Intersection Capacity Utilization			119.2%			ICU Level of Service		H				
Analysis Period (min)			15									
c Critical Lane Group												

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	230	1137	50	723
v/c Ratio	0.76	0.44	0.16	0.28
Control Delay	63.8	4.1	7.0	6.3
Queue Delay	0.0	0.1	0.0	0.0
Total Delay	63.8	4.2	7.0	6.3
Queue Length 50th (ft)	175	53	11	87
Queue Length 95th (ft)	249	m105	34	167
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	530	2608	310	2576
Starvation Cap Reductn	0	460	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.53	0.16	0.28

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	150	62	943	103	46	665
Future Volume (vph)	150	62	943	103	46	665
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.99		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1753		3543		1805	3505
Flt Permitted	0.97		1.00		0.22	1.00
Satd. Flow (perm)	1753		3543		422	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	67	1025	112	50	723
RTOR Reduction (vph)	13	0	4	0	0	0
Lane Group Flow (vph)	217	0	1133	0	50	723
Heavy Vehicles (%)	0%	2%	0%	4%	0%	3%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	21.4		95.6		95.6	95.6
Effective Green, g (s)	21.4		95.6		95.6	95.6
Actuated g/C Ratio	0.16		0.74		0.74	0.74
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	288		2605		310	2577
v/s Ratio Prot	c0.12		c0.32			0.21
v/s Ratio Perm					0.12	
v/c Ratio	0.75		0.43		0.16	0.28
Uniform Delay, d1	51.8		6.7		5.2	5.7
Progression Factor	1.00		0.52		0.88	0.95
Incremental Delay, d2	10.6		0.3		1.0	0.3
Delay (s)	62.3		3.8		5.6	5.7
Level of Service	E		A		A	A
Approach Delay (s)	62.3		3.8			5.7
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	86	1012	683	185	292	84
v/c Ratio	0.23	0.52	0.44	0.13	0.44	0.13
Control Delay	12.5	13.7	15.9	0.2	33.9	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.5	13.7	15.9	0.2	33.9	6.0
Queue Length 50th (ft)	21	144	79	0	185	0
Queue Length 95th (ft)	41	178	97	0	269	35
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	393	1965	1556	1401	659	643
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.52	0.44	0.13	0.44	0.13
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	79	931	628	170	269	77
Future Volume (vph)	79	931	628	170	269	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1615	1805	1615
Flt Permitted	0.28	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	529	3574	3574	1615	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	1012	683	185	292	84
RTOR Reduction (vph)	0	0	0	37	0	53
Lane Group Flow (vph)	86	1012	683	148	292	31
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	71.5	71.5	56.6	104.1	47.5	47.5
Effective Green, g (s)	71.5	71.5	56.6	104.1	47.5	47.5
Actuated g/C Ratio	0.55	0.55	0.44	0.80	0.37	0.37
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	373	1965	1556	1293	659	590
v/s Ratio Prot	0.01	c0.28	0.19	0.04	c0.16	
v/s Ratio Perm	0.11			0.05		0.02
v/c Ratio	0.23	0.52	0.44	0.11	0.44	0.05
Uniform Delay, d1	15.3	18.4	25.6	2.8	31.2	26.7
Progression Factor	0.80	0.69	0.58	0.00	1.00	1.00
Incremental Delay, d2	0.3	0.9	0.8	0.2	2.2	0.2
Delay (s)	12.5	13.6	15.7	0.2	33.4	26.9
Level of Service	B	B	B	A	C	C
Approach Delay (s)		13.5	12.4		31.9	
Approach LOS		B	B		C	
Intersection Summary						
HCM 2000 Control Delay			16.0		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.51			
Actuated Cycle Length (s)			130.0		Sum of lost time (s)	17.5
Intersection Capacity Utilization			51.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	75	1278	866	503	710	45
v/c Ratio	0.22	0.63	0.51	0.35	0.61	0.08
Control Delay	7.4	8.1	25.3	0.8	38.9	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.4	8.1	25.3	0.8	38.9	8.7
Queue Length 50th (ft)	13	148	269	0	257	0
Queue Length 95th (ft)	27	211	331	14	323	28
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	340	2020	1712	1420	1160	554
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.63	0.51	0.35	0.61	0.08

Intersection Summary

HCM Signalized Intersection Capacity Analysis

11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	69	1176	797	463	653	41
Future Volume (vph)	69	1176	797	463	653	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1553	3467	1568
Flt Permitted	0.25	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	466	3574	3574	1553	3467	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	1278	866	503	710	45
RTOR Reduction (vph)	0	0	0	99	0	30
Lane Group Flow (vph)	75	1278	866	404	710	15
Heavy Vehicles (%)	0%	1%	1%	4%	1%	3%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	73.5	73.5	61.0	104.5	43.5	43.5
Effective Green, g (s)	73.5	73.5	61.0	104.5	43.5	43.5
Actuated g/C Ratio	0.57	0.57	0.47	0.80	0.33	0.33
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	325	2020	1677	1326	1160	524
v/s Ratio Prot	0.01	c0.36	0.24	0.10	c0.20	
v/s Ratio Perm	0.12			0.16		0.01
v/c Ratio	0.23	0.63	0.52	0.30	0.61	0.03
Uniform Delay, d1	23.6	19.1	24.2	3.3	36.2	29.1
Progression Factor	0.39	0.35	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	1.4	1.1	0.6	2.4	0.1
Delay (s)	9.5	8.0	25.3	3.9	38.6	29.2
Level of Service	A	A	C	A	D	C
Approach Delay (s)		8.1	17.4		38.0	
Approach LOS		A	B		D	

Intersection Summary

HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Concord Rd & Site Access

10/27/2020



Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	36	68	91	84	55	529	12	617	42
v/c Ratio	0.20	0.24	0.47	0.28	0.10	0.20	0.02	0.43	0.03
Control Delay	27.8	9.5	34.5	9.3	3.9	3.2	3.5	5.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.8	9.5	34.5	9.3	3.9	3.2	3.5	5.1	0.0
Queue Length 50th (ft)	13	0	35	0	5	27	1	80	0
Queue Length 95th (ft)	37	30	75	33	18	53	6	168	0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	417	578	454	583	575	2676	667	1450	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.12	0.20	0.14	0.10	0.20	0.02	0.43	0.03
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↗	↘		↗	↘	↗	↘	↗	↘	↗	↘
Traffic Volume (vph)	32	1	63	74	10	77	51	452	35	11	568	39
Future Volume (vph)	32	1	63	74	10	77	51	452	35	11	568	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1812	1615		1820	1599	1805	3467		1805	1881	1615
Flt Permitted		0.67	1.00		0.73	1.00	0.39	1.00		0.46	1.00	1.00
Satd. Flow (perm)		1266	1615		1379	1599	746	3467		866	1881	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	1	68	80	11	84	55	491	38	12	617	42
RTOR Reduction (vph)	0	0	60	0	0	74	0	5	0	0	0	0
Lane Group Flow (vph)	0	36	8	0	91	10	55	524	0	12	617	42
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	3%	3%	0%	1%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		8.4	8.4		8.4	8.4	51.7	51.7		51.7	51.7	60.1
Effective Green, g (s)		8.4	8.4		8.4	8.4	51.7	51.7		51.7	51.7	60.1
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.75	0.75		0.75	0.75	0.87
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		153	196		167	194	558	2593		647	1407	1615
v/s Ratio Prot								0.15			c0.33	0.00
v/s Ratio Perm		0.03	0.01		c0.07	0.01	0.07			0.01		0.02
v/c Ratio		0.24	0.04		0.54	0.05	0.10	0.20		0.02	0.44	0.03
Uniform Delay, d1		27.4	26.8		28.6	26.8	2.4	2.6		2.2	3.3	0.6
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.8	0.1		3.6	0.1	0.4	0.2		0.1	1.0	0.0
Delay (s)		28.2	26.9		32.2	26.9	2.7	2.8		2.3	4.3	0.6
Level of Service		C	C		C	C	A	A		A	A	A
Approach Delay (s)		27.4			29.7			2.8			4.0	
Approach LOS		C			C			A			A	

Intersection Summary

HCM 2000 Control Delay	8.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	69.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	39	1432	91	1944	130	83
v/c Ratio	0.32	0.63	0.36	0.82	0.50	0.30
Control Delay	20.3	3.5	4.8	6.4	39.4	22.2
Queue Delay	0.0	0.3	0.0	1.1	0.1	0.0
Total Delay	20.3	3.8	4.8	7.5	39.4	22.2
Queue Length 50th (ft)	3	37	9	130	63	18
Queue Length 95th (ft)	m18	42	m12	144	132	69
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	129	2285	264	2376	259	273
Starvation Cap Reductn	0	294	0	39	0	0
Spillback Cap Reductn	0	0	0	211	2	3
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.72	0.34	0.90	0.51	0.31










Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

18: Kingston Pike & Lendon Welsch Way

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1261	56	84	1757	31	46	2	72	17	6	53
Future Volume (vph)	36	1261	56	84	1757	31	46	2	72	17	6	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.99		1.00	1.00			0.92			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1570	3511		1805	3523			1713			1626	
Flt Permitted	0.05	1.00		0.13	1.00			0.84			0.91	
Satd. Flow (perm)	79	3511		242	3523			1467			1499	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1371	61	91	1910	34	50	2	78	18	7	58
RTOR Reduction (vph)	0	3	0	0	1	0	0	41	0	0	49	0
Lane Group Flow (vph)	39	1429	0	91	1943	0	0	89	0	0	34	0
Heavy Vehicles (%)	15%	2%	6%	0%	2%	14%	0%	0%	0%	12%	0%	3%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	87.9	83.2		94.3	86.4			19.4			19.4	
Effective Green, g (s)	87.9	83.2		94.3	86.4			19.4			19.4	
Actuated g/C Ratio	0.68	0.64		0.73	0.66			0.15			0.15	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	107	2247		270	2341			218			223	
v/s Ratio Prot	0.01	0.41		0.02	0.55							
v/s Ratio Perm	0.23			0.22				0.06			0.02	
v/c Ratio	0.36	0.64		0.34	0.83			0.41			0.15	
Uniform Delay, d1	41.1	14.2		20.5	16.3			50.1			48.1	
Progression Factor	0.85	0.18		0.27	0.26			1.00			1.00	
Incremental Delay, d2	1.7	1.1		0.5	2.4			5.6			0.3	
Delay (s)	36.6	3.7		6.0	6.6			55.7			48.4	
Level of Service	D	A		A	A			E			D	
Approach Delay (s)		4.6			6.6			55.7			48.4	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay	8.4			HCM 2000 Level of Service			A					
HCM 2000 Volume to Capacity ratio	0.74											
Actuated Cycle Length (s)	130.0			Sum of lost time (s)			19.5					
Intersection Capacity Utilization	82.0%			ICU Level of Service			E					
Analysis Period (min)	15											
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	3	1212	129	241	1761	279	1	218	11
v/c Ratio	0.02	0.67	0.14	0.89	0.79	0.66	0.00	0.43	0.12
Control Delay	4.0	10.2	0.7	46.9	13.3	62.4	48.0	5.6	49.3
Queue Delay	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Total Delay	4.0	10.2	0.7	46.9	14.0	62.4	48.0	5.6	49.3
Queue Length 50th (ft)	0	75	0	82	97	117	1	0	6
Queue Length 95th (ft)	m1	m253	m10	m#212	#1002	160	7	41	26
Internal Link Dist (ft)		937			449		417		100
Turn Bay Length (ft)	125		100	125		200		200	
Base Capacity (vph)	143	1796	950	272	2242	504	273	509	255
Starvation Cap Reductn	0	0	0	0	179	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.67	0.14	0.89	0.85	0.55	0.00	0.43	0.04

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.





















Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

22: Brooklawn St & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1115	119	222	1617	3	257	1	201	4	3	4
Future Volume (vph)	3	1115	119	222	1617	3	257	1	201	4	3	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1805	3539	1615	1787	3573		3502	1900	1615		1774	
Flt Permitted	0.07	1.00	1.00	0.11	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (perm)	134	3539	1615	205	3573		3502	1900	1615		1774	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	1212	129	241	1758	3	279	1	218	4	3	4
RTOR Reduction (vph)	0	0	67	0	0	0	0	0	164	0	4	0
Lane Group Flow (vph)	3	1212	62	241	1761	0	279	1	54	0	7	0
Heavy Vehicles (%)	0%	2%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)	58.0	56.9	62.4	80.1	72.5		15.6	15.6	32.3		2.8	
Effective Green, g (s)	58.0	56.9	62.4	80.1	72.5		15.6	15.6	32.3		2.8	
Actuated g/C Ratio	0.45	0.44	0.48	0.62	0.56		0.12	0.12	0.25		0.02	
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	73	1548	775	329	1992		420	228	401		38	
v/s Ratio Prot	0.00	0.34	c0.00	c0.09	c0.49		c0.08	0.00	0.02		c0.00	
v/s Ratio Perm	0.02		0.03	0.36					0.02			
v/c Ratio	0.04	0.78	0.08	0.73	0.88		0.66	0.00	0.14		0.19	
Uniform Delay, d1	60.1	31.3	18.3	38.6	25.1		54.7	50.4	38.0		62.5	
Progression Factor	0.28	0.35	0.41	0.60	0.50		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.1	1.8	0.0	4.9	3.7		3.9	0.0	0.2		2.4	
Delay (s)	16.7	12.9	7.4	27.9	16.2		58.6	50.4	38.1		64.9	
Level of Service	B	B	A	C	B		E	D	D		E	
Approach Delay (s)		12.4			17.6			49.6			64.9	
Approach LOS		B			B			D			E	
Intersection Summary												
HCM 2000 Control Delay			20.0			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			79.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	50	1290	502	1746	153	78	376	126	152
v/c Ratio	0.36	1.01	0.98	0.83	0.64	0.51	0.40	0.31	0.70
Control Delay	17.6	45.6	73.6	26.8	71.5	67.8	17.3	57.0	60.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	45.6	73.6	26.8	71.5	67.8	17.3	57.0	60.2
Queue Length 50th (ft)	7	~456	~399	638	64	64	70	51	97
Queue Length 95th (ft)	m18	#720	#619	759	#136	114	103	87	167
Internal Link Dist (ft)		746		717		568			373
Turn Bay Length (ft)	150		150		180		300	180	
Base Capacity (vph)	138	1281	512	2096	239	259	949	401	277
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	1.01	0.98	0.83	0.64	0.30	0.40	0.31	0.55

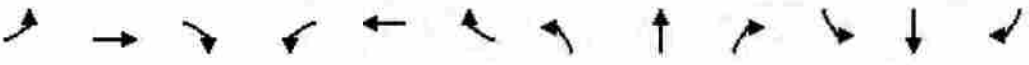








Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

1: Concord Rd/West End Ave & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	46	1139	48	462	1515	91	141	72	346	116	68	72
Future Volume (vph)	46	1139	48	462	1515	91	141	72	346	116	68	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.97	1.00	0.88	0.97	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	1.00	0.85	1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3501		1770	3509		3335	1827	2707	3502	1745	
Flt Permitted	0.09	1.00		0.08	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	165	3501		141	3509		3335	1827	2707	3502	1745	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	1238	52	502	1647	99	153	78	376	126	74	78
RTOR Reduction (vph)	0	3	0	0	3	0	0	0	56	0	30	0
Lane Group Flow (vph)	50	1287	0	502	1743	0	153	78	320	126	122	0
Heavy Vehicles (%)	0%	2%	14%	2%	2%	2%	5%	4%	5%	0%	1%	0%
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA	pm+ov	Prot	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6					8			
Actuated Green, G (s)	50.7	46.2		86.0	75.0		10.6	9.6	42.9	14.9	13.9	
Effective Green, g (s)	50.7	46.2		86.0	75.0		10.6	9.6	42.9	14.9	13.9	
Actuated g/C Ratio	0.39	0.36		0.66	0.58		0.08	0.07	0.33	0.11	0.11	
Clearance Time (s)	6.5	6.5		6.5	6.5		6.5	6.5	6.5	6.5	6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	121	1244		510	2024		271	134	893	401	186	
v/s Ratio Prot	0.01	0.37		c0.25	0.50		c0.05	0.04	0.09	c0.04	c0.07	
v/s Ratio Perm	0.15			c0.40					0.03			
v/c Ratio	0.41	1.03		0.98	0.86		0.56	0.58	0.36	0.31	0.65	
Uniform Delay, d1	27.1	41.9		40.9	23.1		57.5	58.3	33.1	52.9	55.7	
Progression Factor	0.76	0.48		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.8	32.2		35.5	5.1		2.7	6.3	0.2	0.5	8.0	
Delay (s)	22.5	52.4		76.5	28.2		60.2	64.6	33.3	53.3	63.7	
Level of Service	C	D		E	C		E	E	C	D	E	
Approach Delay (s)		51.3			39.0			44.1			59.0	
Approach LOS		D			D			D			E	
Intersection Summary												
HCM 2000 Control Delay		44.6			HCM 2000 Level of Service			D				
HCM 2000 Volume to Capacity ratio		0.93										
Actuated Cycle Length (s)		130.0			Sum of lost time (s)			26.0				
Intersection Capacity Utilization		92.4%			ICU Level of Service			F				
Analysis Period (min)		15										
c Critical Lane Group												

Queues

3: Kingston Pike & N Campbell Station Rd

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	487	1034	413	93	1376	542	384	523	472	715	701
v/c Ratio	0.81	0.60	0.43	0.35	0.98	0.63	1.15	0.94	0.93	1.03	1.00
Control Delay	43.4	25.8	4.4	16.4	39.1	8.3	119.3	50.6	79.1	92.9	66.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.4	25.8	4.4	16.4	39.1	8.3	119.3	50.6	79.1	92.9	66.9
Queue Length 50th (ft)	154	323	18	35	544	79	~196	242	193	~338	~509
Queue Length 95th (ft)	#222	392	77	m21	#744	267	#236	#320	#298	#464	#781
Internal Link Dist (ft)		673			937			607		627	
Turn Bay Length (ft)	300		350	160		350	150		300		325
Base Capacity (vph)	600	1728	963	267	1401	860	335	555	509	694	699
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.60	0.43	0.35	0.98	0.63	1.15	0.94	0.93	1.03	1.00

























Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

3: Kingston Pike & N Campbell Station Rd

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	448	951	380	86	1266	499	353	412	69	434	658	645
Future Volume (vph)	448	951	380	86	1266	499	353	412	69	434	658	645
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583	3433	3463		3433	3539	1583
Flt Permitted	0.09	1.00	1.00	0.28	1.00	1.00	0.33	1.00		0.46	1.00	1.00
Satd. Flow (perm)	321	3539	1583	516	3539	1583	1205	3463		1656	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	487	1034	413	93	1376	542	384	448	75	472	715	701
RTOR Reduction (vph)	0	0	190	0	0	69	0	10	0	0	0	91
Lane Group Flow (vph)	487	1034	223	93	1376	473	384	513	0	472	715	610
Turn Type	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2		1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	63.5	63.5	63.5	51.5	51.5	65.0	20.5	20.5		25.5	25.5	44.0
Effective Green, g (s)	63.5	63.5	63.5	51.5	51.5	65.0	20.5	20.5		25.5	25.5	44.0
Actuated g/C Ratio	0.49	0.49	0.49	0.40	0.40	0.50	0.16	0.16		0.20	0.20	0.34
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	599	1728	773	267	1401	791	335	546		509	694	614
v/s Ratio Prot	0.12	0.29		0.02	c0.39	0.06	0.07	c0.15		0.10	c0.20	c0.14
v/s Ratio Perm	0.28		0.14	0.12		0.24	0.11			0.09		0.24
v/c Ratio	0.81	0.60	0.29	0.35	0.98	0.60	1.15	0.94		0.93	1.03	0.99
Uniform Delay, d1	36.4	24.0	19.8	28.9	38.8	23.2	53.4	54.1		50.3	52.2	42.8
Progression Factor	1.00	1.00	1.00	0.46	0.58	0.60	0.43	0.43		1.00	1.00	1.00
Incremental Delay, d2	8.3	1.5	0.9	0.5	15.4	0.8	94.3	25.6		23.1	42.1	34.4
Delay (s)	44.7	25.6	20.7	13.8	37.9	14.7	117.1	48.9		73.3	94.4	77.2
Level of Service	D	C	C	B	D	B	F	D		E	F	E
Approach Delay (s)		29.4			30.6			77.8			82.8	
Approach LOS		C			C			E			F	
Intersection Summary												
HCM 2000 Control Delay			51.2			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			1.08									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)				26.0		
Intersection Capacity Utilization			101.3%			ICU Level of Service				G		
Analysis Period (min)			15									
c Critical Lane Group												

Queues

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Lane Group	EBL	SET	NWL	NWT
Lane Group Flow (vph)	230	1137	50	723
v/c Ratio	0.76	0.44	0.16	0.28
Control Delay	63.8	4.0	10.3	9.7
Queue Delay	0.0	0.1	0.0	0.0
Total Delay	63.8	4.1	10.3	9.7
Queue Length 50th (ft)	175	71	11	87
Queue Length 95th (ft)	249	m101	72	354
Internal Link Dist (ft)	392	607		1164
Turn Bay Length (ft)			70	
Base Capacity (vph)	530	2608	310	2576
Starvation Cap Reductn	0	427	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.52	0.16	0.28

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

5: S Campbell Station Rd & Municipal Dr.

10/27/2020



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Volume (vph)	150	62	943	103	46	665
Future Volume (vph)	150	62	943	103	46	665
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.5		6.5	6.5
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.96		0.99		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1753		3543		1805	3505
Flt Permitted	0.97		1.00		0.22	1.00
Satd. Flow (perm)	1753		3543		422	3505
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	67	1025	112	50	723
RTOR Reduction (vph)	13	0	4	0	0	0
Lane Group Flow (vph)	217	0	1133	0	50	723
Heavy Vehicles (%)	0%	2%	0%	4%	0%	3%
Turn Type	Prot		NA		Perm	NA
Protected Phases	4		6			2
Permitted Phases					2	
Actuated Green, G (s)	21.4		95.6		95.6	95.6
Effective Green, g (s)	21.4		95.6		95.6	95.6
Actuated g/C Ratio	0.16		0.74		0.74	0.74
Clearance Time (s)	6.5		6.5		6.5	6.5
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	288		2605		310	2577
v/s Ratio Prot	c0.12		c0.32			0.21
v/s Ratio Perm					0.12	
v/c Ratio	0.75		0.43		0.16	0.28
Uniform Delay, d1	51.8		6.7		5.2	5.7
Progression Factor	1.00		0.51		1.35	1.50
Incremental Delay, d2	10.6		0.3		1.0	0.3
Delay (s)	62.3		3.8		8.0	8.8
Level of Service	E		A		A	A
Approach Delay (s)	62.3		3.8			8.8
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	86	1012	683	185	292	84
v/c Ratio	0.23	0.52	0.44	0.13	0.44	0.13
Control Delay	11.0	12.4	15.9	0.2	33.9	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.0	12.4	15.9	0.2	33.9	6.0
Queue Length 50th (ft)	20	133	79	0	185	0
Queue Length 95th (ft)	38	165	97	0	269	35
Internal Link Dist (ft)		1164	2181		270	
Turn Bay Length (ft)	175			125		200
Base Capacity (vph)	393	1965	1556	1401	659	643
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.52	0.44	0.13	0.44	0.13
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

7: S Campbell Station Rd & Brooklawn St

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	79	931	628	170	269	77
Future Volume (vph)	79	931	628	170	269	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1615	1805	1615
Flt Permitted	0.28	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	529	3574	3574	1615	1805	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	1012	683	185	292	84
RTOR Reduction (vph)	0	0	0	37	0	53
Lane Group Flow (vph)	86	1012	683	148	292	31
Heavy Vehicles (%)	0%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	71.5	71.5	56.6	104.1	47.5	47.5
Effective Green, g (s)	71.5	71.5	56.6	104.1	47.5	47.5
Actuated g/C Ratio	0.55	0.55	0.44	0.80	0.37	0.37
Clearance Time (s)	6.5	6.5	6.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	373	1965	1556	1293	659	590
v/s Ratio Prot	0.01	c0.28	0.19	0.04	c0.16	
v/s Ratio Perm	0.11			0.05		0.02
v/c Ratio	0.23	0.52	0.44	0.11	0.44	0.05
Uniform Delay, d1	15.3	18.4	25.6	2.8	31.2	26.7
Progression Factor	0.69	0.62	0.58	0.00	1.00	1.00
Incremental Delay, d2	0.3	0.9	0.8	0.2	2.2	0.2
Delay (s)	10.9	12.3	15.7	0.2	33.4	26.9
Level of Service	B	B	B	A	C	C
Approach Delay (s)		12.2	12.4		31.9	
Approach LOS		B	B		C	

Intersection Summary

HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

11: S Campbell Station Rd & Concord Rd

10/27/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	75	1278	866	503	710	45
v/c Ratio	0.22	0.63	0.51	0.35	0.61	0.08
Control Delay	7.9	8.4	25.3	0.8	38.9	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.9	8.4	25.3	0.8	38.9	8.7
Queue Length 50th (ft)	14	162	269	0	257	0
Queue Length 95th (ft)	27	212	331	14	323	28
Internal Link Dist (ft)		2181	561		478	
Turn Bay Length (ft)	160			225	300	250
Base Capacity (vph)	340	2020	1712	1420	1160	554
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.63	0.51	0.35	0.61	0.08
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

11: S Campbell Station Rd & Concord Rd

10/27/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	69	1176	797	463	653	41
Future Volume (vph)	69	1176	797	463	653	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1805	3574	3574	1553	3467	1568
Flt Permitted	0.25	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	466	3574	3574	1553	3467	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	1278	866	503	710	45
RTOR Reduction (vph)	0	0	0	99	0	30
Lane Group Flow (vph)	75	1278	866	404	710	15
Heavy Vehicles (%)	0%	1%	1%	4%	1%	3%
Turn Type	pm+pt	NA	NA	pm+ov	Prot	Perm
Protected Phases	1	6	2	8	8	
Permitted Phases	6			2		8
Actuated Green, G (s)	73.5	73.5	61.0	104.5	43.5	43.5
Effective Green, g (s)	73.5	73.5	61.0	104.5	43.5	43.5
Actuated g/C Ratio	0.57	0.57	0.47	0.80	0.33	0.33
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	325	2020	1677	1326	1160	524
v/s Ratio Prot	0.01	c0.36	0.24	0.10	c0.20	
v/s Ratio Perm	0.12			0.16		0.01
v/c Ratio	0.23	0.63	0.52	0.30	0.61	0.03
Uniform Delay, d1	23.6	19.1	24.2	3.3	36.2	29.1
Progression Factor	0.42	0.36	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	1.4	1.1	0.6	2.4	0.1
Delay (s)	10.3	8.3	25.3	3.9	38.6	29.2
Level of Service	B	A	C	A	D	C
Approach Delay (s)		8.4	17.4		38.0	
Approach LOS		A	B		D	

Intersection Summary

HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

16: Concord Rd & Site Access

10/27/2020




Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	36	68	91	84	55	529	12	617	42
v/c Ratio	0.20	0.24	0.47	0.28	0.10	0.20	0.02	0.43	0.03
Control Delay	27.8	9.5	34.5	9.3	3.9	3.2	3.5	5.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.8	9.5	34.5	9.3	3.9	3.2	3.5	5.1	0.0
Queue Length 50th (ft)	13	0	35	0	5	27	1	80	0
Queue Length 95th (ft)	37	30	75	33	18	53	6	168	0
Internal Link Dist (ft)	382		246			410		568	
Turn Bay Length (ft)		125		100	100		100		200
Base Capacity (vph)	417	578	454	583	575	2676	667	1450	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.12	0.20	0.14	0.10	0.20	0.02	0.43	0.03
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

16: Concord Rd & Site Access

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘		↗	↘	↗	↘	↗	↘	↗	↘
Traffic Volume (vph)	32	1	63	74	10	77	51	452	35	11	568	39
Future Volume (vph)	32	1	63	74	10	77	51	452	35	11	568	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1812	1615		1820	1599	1805	3467		1805	1881	1615
Flt Permitted		0.67	1.00		0.73	1.00	0.39	1.00		0.46	1.00	1.00
Satd. Flow (perm)		1266	1615		1379	1599	746	3467		866	1881	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	1	68	80	11	84	55	491	38	12	617	42
RTOR Reduction (vph)	0	0	60	0	0	74	0	5	0	0	0	0
Lane Group Flow (vph)	0	36	8	0	91	10	55	524	0	12	617	42
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	3%	3%	0%	1%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	custom
Protected Phases		4			8!			2			6	4!
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)		8.4	8.4		8.4	8.4	51.7	51.7		51.7	51.7	60.1
Effective Green, g (s)		8.4	8.4		8.4	8.4	51.7	51.7		51.7	51.7	60.1
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.75	0.75		0.75	0.75	0.87
Clearance Time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		153	196		167	194	558	2593		647	1407	1615
v/s Ratio Prot								0.15			c0.33	0.00
v/s Ratio Perm		0.03	0.01		c0.07	0.01	0.07			0.01		0.02
v/c Ratio		0.24	0.04		0.54	0.05	0.10	0.20		0.02	0.44	0.03
Uniform Delay, d1		27.4	26.8		28.6	26.8	2.4	2.6		2.2	3.3	0.6
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.8	0.1		3.6	0.1	0.4	0.2		0.1	1.0	0.0
Delay (s)		28.2	26.9		32.2	26.9	2.7	2.8		2.3	4.3	0.6
Level of Service		C	C		C	C	A	A		A	A	A
Approach Delay (s)		27.4			29.7			2.8			4.0	
Approach LOS		C			C			A			A	

Intersection Summary

HCM 2000 Control Delay	8.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	69.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Queues

18: Kingston Pike & Lendon Welsch Way

10/27/2020



Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	39	1432	91	1944	130	83
v/c Ratio	0.32	0.63	0.36	0.82	0.50	0.30
Control Delay	19.7	3.2	4.8	6.4	39.4	22.2
Queue Delay	0.0	0.2	0.0	1.1	0.1	0.0
Total Delay	19.7	3.5	4.8	7.5	39.4	22.2
Queue Length 50th (ft)	1	37	9	130	63	18
Queue Length 95th (ft)	m18	44	m12	144	132	69
Internal Link Dist (ft)		449		746	93	431
Turn Bay Length (ft)	150		125			
Base Capacity (vph)	129	2285	264	2376	259	273
Starvation Cap Reductn	0	242	0	39	0	0
Spillback Cap Reductn	0	0	0	210	2	3
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.70	0.34	0.90	0.51	0.31





Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

18: Kingston Pike & Lendon Welsch Way

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	1261	56	84	1757	31	46	2	72	17	6	53
Future Volume (vph)	36	1261	56	84	1757	31	46	2	72	17	6	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.99		1.00	1.00			0.92			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1570	3511		1805	3523			1713			1626	
Flt Permitted	0.05	1.00		0.13	1.00			0.84			0.91	
Satd. Flow (perm)	79	3511		242	3523			1467			1499	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1371	61	91	1910	34	50	2	78	18	7	58
RTOR Reduction (vph)	0	3	0	0	1	0	0	41	0	0	49	0
Lane Group Flow (vph)	39	1429	0	91	1943	0	0	89	0	0	34	0
Heavy Vehicles (%)	15%	2%	6%	0%	2%	14%	0%	0%	0%	12%	0%	3%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	87.9	83.2		94.3	86.4			19.4			19.4	
Effective Green, g (s)	87.9	83.2		94.3	86.4			19.4			19.4	
Actuated g/C Ratio	0.68	0.64		0.73	0.66			0.15			0.15	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5			6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	107	2247		270	2341			218			223	
v/s Ratio Prot	0.01	0.41		c0.02	c0.55							
v/s Ratio Perm	0.23			0.22				c0.06			0.02	
v/c Ratio	0.36	0.64		0.34	0.83			0.41			0.15	
Uniform Delay, d1	41.1	14.2		20.5	16.3			50.1			48.1	
Progression Factor	0.81	0.16		0.27	0.26			1.00			1.00	
Incremental Delay, d2	1.7	1.1		0.5	2.4			5.6			0.3	
Delay (s)	35.1	3.4		6.0	6.6			55.7			48.4	
Level of Service	D	A		A	A			E			D	
Approach Delay (s)		4.3			6.6			55.7			48.4	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay	8.3			HCM 2000 Level of Service			A					
HCM 2000 Volume to Capacity ratio	0.74											
Actuated Cycle Length (s)	130.0			Sum of lost time (s)			19.5					
Intersection Capacity Utilization	82.0%			ICU Level of Service			E					
Analysis Period (min)	15											
c Critical Lane Group												

Queues

22: Brooklawn St & Kingston Pike

10/27/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	3	1212	129	241	1761	279	1	218	11
v/c Ratio	0.02	0.67	0.14	0.89	0.79	0.66	0.00	0.43	0.12
Control Delay	4.7	12.7	0.6	46.3	12.4	62.4	48.0	5.6	49.3
Queue Delay	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Total Delay	4.7	12.7	0.6	46.3	13.0	62.4	48.0	5.6	49.3
Queue Length 50th (ft)	0	107	0	87	81	117	1	0	6
Queue Length 95th (ft)	m1	m407	m8	m#212	#1002	160	7	41	26
Internal Link Dist (ft)		937			449		417		100
Turn Bay Length (ft)	125		100	125		200		200	
Base Capacity (vph)	143	1796	950	272	2242	504	273	509	255
Starvation Cap Reductn	0	0	0	0	179	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.67	0.14	0.89	0.85	0.55	0.00	0.43	0.04

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.























Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

22: Brooklawn St & Kingston Pike

10/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1115	119	222	1617	3	257	1	201	4	3	4
Future Volume (vph)	3	1115	119	222	1617	3	257	1	201	4	3	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (prot)	1805	3539	1615	1787	3573		3502	1900	1615		1774	
Flt Permitted	0.07	1.00	1.00	0.11	1.00		0.95	1.00	1.00		0.98	
Satd. Flow (perm)	134	3539	1615	205	3573		3502	1900	1615		1774	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	1212	129	241	1758	3	279	1	218	4	3	4
RTOR Reduction (vph)	0	0	67	0	0	0	0	0	164	0	4	0
Lane Group Flow (vph)	3	1212	62	241	1761	0	279	1	54	0	7	0
Heavy Vehicles (%)	0%	2%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	custom	pm+pt	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	5	2	3	1	6		8	8	1	4	4	
Permitted Phases	2		2	6					8			
Actuated Green, G (s)	58.0	56.9	62.4	80.1	72.5		15.6	15.6	32.3		2.8	
Effective Green, g (s)	58.0	56.9	62.4	80.1	72.5		15.6	15.6	32.3		2.8	
Actuated g/C Ratio	0.45	0.44	0.48	0.62	0.56		0.12	0.12	0.25		0.02	
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5		6.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	73	1548	775	329	1992		420	228	401		38	
v/s Ratio Prot	0.00	0.34	c0.00	c0.09	c0.49		c0.08	0.00	0.02		c0.00	
v/s Ratio Perm	0.02		0.03	0.36					0.02			
v/c Ratio	0.04	0.78	0.08	0.73	0.88		0.66	0.00	0.14		0.19	
Uniform Delay, d1	60.1	31.3	18.3	38.6	25.1		54.7	50.4	38.0		62.5	
Progression Factor	0.32	0.43	0.25	0.58	0.44		1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.2	2.8	0.0	4.9	3.7		3.9	0.0	0.2		2.4	
Delay (s)	19.7	16.3	4.7	27.2	14.9		58.6	50.4	38.1		64.9	
Level of Service	B	B	A	C	B		E	D	D		E	
Approach Delay (s)		15.2			16.4			49.6			64.9	
Approach LOS		B			B			D			E	
Intersection Summary												
HCM 2000 Control Delay			20.4			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			79.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM 6th TWSC
9: Brooklawn St & Pinnacle Access

10/27/2020

Intersection

Int Delay, s/veh 3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Vol, veh/h	4	0	78	25	0	8	87	171	20	10	254	9
Future Vol, veh/h	4	0	78	25	0	8	87	171	20	10	254	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	75	-	-	70	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	0	85	27	0	9	95	186	22	11	276	10







Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	695	701	281	733	695	197	286	0	0	208	0	0
Stage 1	303	303	-	387	387	-	-	-	-	-	-	-
Stage 2	392	398	-	346	308	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	357	363	758	336	366	844	1276	-	-	1363	-	-
Stage 1	706	664	-	637	610	-	-	-	-	-	-	-
Stage 2	633	603	-	670	660	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	331	334	758	280	336	844	1276	-	-	1363	-	-
Mov Cap-2 Maneuver	331	334	-	280	336	-	-	-	-	-	-	-
Stage 1	654	659	-	590	565	-	-	-	-	-	-	-
Stage 2	580	558	-	590	655	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	17.1	2.5	0.3
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1276	-	-	713	334	1363	-
HCM Lane V/C Ratio	0.074	-	-	0.125	0.107	0.008	-
HCM Control Delay (s)	8	-	-	10.8	17.1	7.7	-
HCM Lane LOS	A	-	-	B	C	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.4	0.4	0	-

Intersection

Int Delay, s/veh 13.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	72	166	69	18	127	79	175	10	26	105	20	100
Future Vol, veh/h	72	166	69	18	127	79	175	10	26	105	20	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	78	180	75	20	138	86	190	11	28	114	22	109

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	224	0	0	255	0	0	661	638	218	614	632	181
Stage 1	-	-	-	-	-	-	374	374	-	221	221	-
Stage 2	-	-	-	-	-	-	287	264	-	393	411	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1345	-	-	1310	-	-	376	394	822	404	398	862
Stage 1	-	-	-	-	-	-	647	618	-	781	720	-
Stage 2	-	-	-	-	-	-	720	690	-	632	595	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1345	-	-	1310	-	-	297	366	822	360	369	862
Mov Cap-2 Maneuver	-	-	-	-	-	-	297	366	-	360	369	-
Stage 1	-	-	-	-	-	-	609	582	-	736	709	-
Stage 2	-	-	-	-	-	-	601	680	-	564	560	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	1.8	0.6	38.5	19.6
HCM LOS			E	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SERSWLn1
Capacity (veh/h)	326	1310	-	-	1345	-	487
HCM Lane V/C Ratio	0.704	0.015	-	-	0.058	-	0.502
HCM Control Delay (s)	38.5	7.8	-	-	7.8	-	19.6
HCM Lane LOS	E	A	-	-	A	-	C
HCM 95th %tile Q(veh)	5	0	-	-	0.2	-	2.8

HCM 6th Roundabout
26: Brooklawn St & Kroger Roundabout

10/27/2020

Intersection			
Intersection Delay, s/veh	4.3		
Intersection LOS	A		
Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	89	201	285
Demand Flow Rate, veh/h	91	205	291
Vehicles Circulating, veh/h	242	33	23
Vehicles Exiting, veh/h	72	300	215
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	4.2	4.0	4.6
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	91	205	291
Cap Entry Lane, veh/h	1078	1334	1348
Entry HV Adj Factor	0.978	0.983	0.980
Flow Entry, veh/h	89	201	285
Cap Entry, veh/h	1054	1311	1321
V/C Ratio	0.084	0.154	0.216
Control Delay, s/veh	4.2	4.0	4.6
LOS	A	A	A
95th %tile Queue, veh	0	1	1

Intersection

Int Delay, s/veh 1

Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations		↗	↘	↗	↗	
Traffic Vol, veh/h	0	29	34	262	194	0
Future Vol, veh/h	0	29	34	262	194	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	32	37	285	211	0

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	- 211	211	0 - 0
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	- 6.22	4.12	- - -
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	- 3.318	2.218	- - -
Pot Cap-1 Maneuver	0 829	1360	- - 0
Stage 1	0	-	- - 0
Stage 2	0	-	- - 0
Platoon blocked, %			- -
Mov Cap-1 Maneuver	- 829	1360	- - -
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

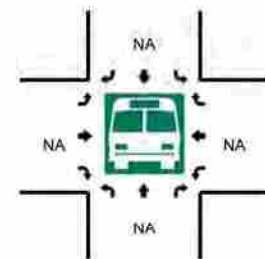
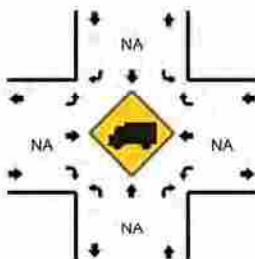
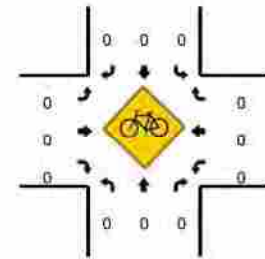
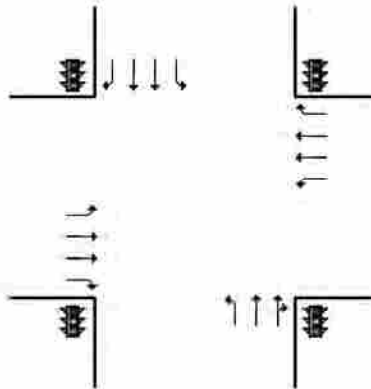
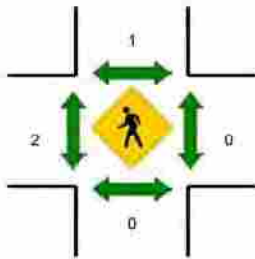
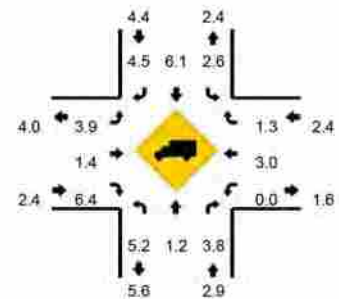
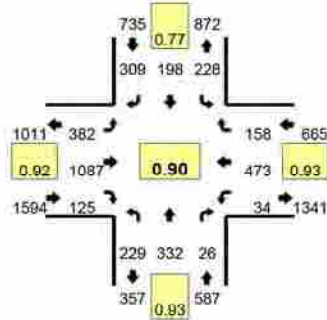
Approach	WB	SE	NW
HCM Control Delay, s	9.5	0.9	0
HCM LOS	A		

Minor Lane/Major Mvmt	NWTLN1	SEL	SET
Capacity (veh/h)	- 829	1360	-
HCM Lane V/C Ratio	- 0.038	0.027	-
HCM Control Delay (s)	- 9.5	7.7	-
HCM Lane LOS	- A	A	-
HCM 95th %tile Q(veh)	- 0.1	0.1	-

LOCATION: N Campbell Station – Kingston Pike
CITY/STATE: Farragut, TN

QC JOB #: 13729569
DATE: Thu, Apr 14 2016

Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM



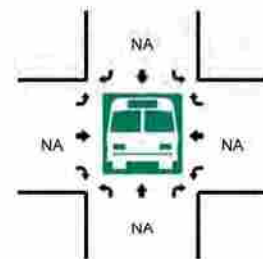
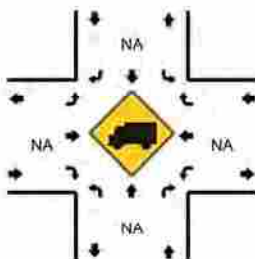
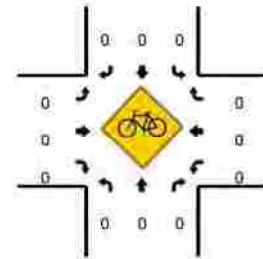
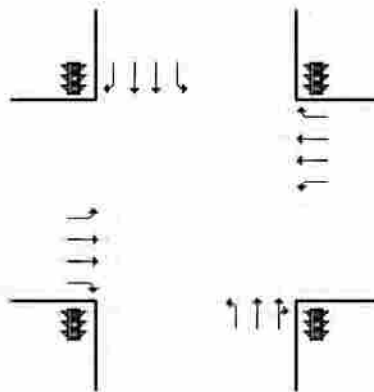
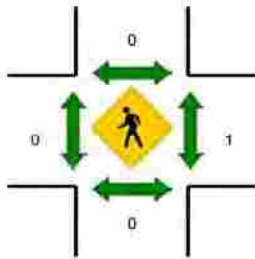
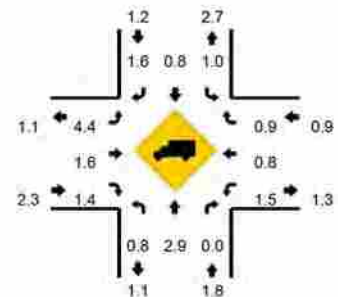
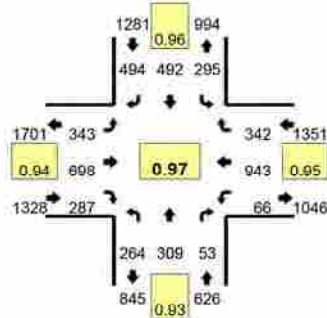
15-Min Count Period Beginning At	N Campbell Station (Northbound)				N Campbell Station (Southbound)				Kingston Pike (Eastbound)				Kingston Pike (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	22	58	3	0	23	19	23	0	75	173	23	0	2	42	34	0	497	
7:15 AM	43	94	10	0	45	25	36	0	87	242	21	0	6	85	50	0	744	
7:30 AM	59	89	5	0	59	54	76	0	92	261	33	0	3	112	30	0	873	
7:45 AM	71	82	4	0	64	63	112	0	98	297	33	0	10	127	33	0	994	3108
8:00 AM	43	81	8	0	56	37	56	0	107	294	32	0	10	110	46	0	880	3491
8:15 AM	56	80	9	0	49	44	65	0	85	235	27	0	11	124	49	0	834	3581
8:30 AM	48	90	21	0	45	34	63	0	79	163	35	0	20	115	56	0	769	3477
8:45 AM	59	75	11	0	58	52	71	0	79	162	33	0	11	103	35	0	749	3232
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	284	328	16	0	256	252	448	0	392	1188	132	0	40	508	132	0	3976	
Heavy Trucks	12	4	0	0	4	8	4	0	24	16	8	0	0	12	0	0	92	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: N Campbell Station – Kingston Pike
CITY/STATE: Farragut, TN

QC JOB #: 13729571
DATE: Thu, Apr 14 2016

Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:00 PM -- 5:15 PM



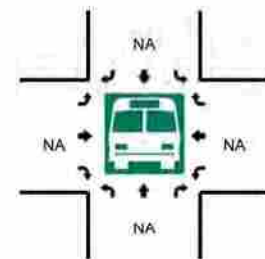
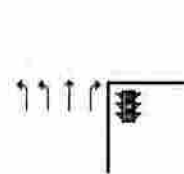
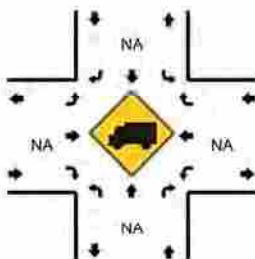
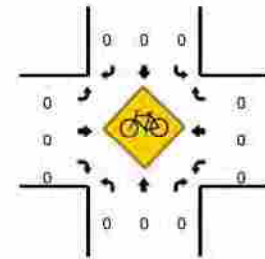
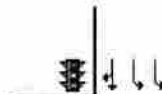
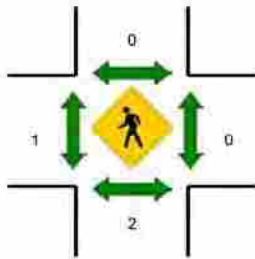
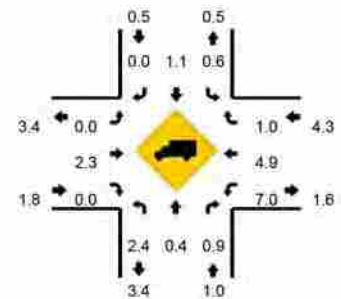
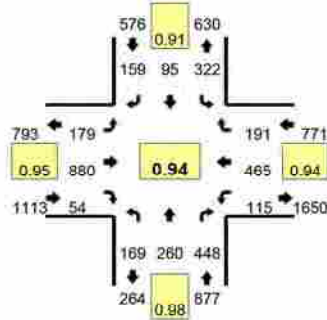
15-Min Count Period Beginning At	N Campbell Station (Northbound)				N Campbell Station (Southbound)				Kingston Pike (Eastbound)				Kingston Pike (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	51	69	22	0	74	67	71	0	69	148	41	0	29	193	71	0	905	
2:15 PM	52	51	14	0	64	80	81	0	61	181	48	0	20	177	86	0	915	
2:30 PM	44	68	20	0	62	73	81	0	71	146	51	0	14	193	75	0	898	
2:45 PM	64	46	18	0	84	77	93	0	58	141	46	0	18	214	84	0	943	3661
3:00 PM	70	74	27	0	85	88	84	0	72	156	63	0	16	186	80	0	1001	3757
3:15 PM	41	67	19	0	71	77	83	0	88	201	66	0	21	192	62	0	988	3830
3:30 PM	68	71	26	0	78	105	76	0	67	180	50	0	20	232	88	0	1061	3993
3:45 PM	50	59	16	0	64	48	93	0	72	160	61	0	16	259	92	0	990	4040
4:00 PM	72	80	20	0	86	124	109	0	55	125	59	0	22	236	82	0	1070	4109
4:15 PM	56	69	13	0	61	99	96	0	79	154	55	0	15	252	84	0	1033	4154
4:30 PM	50	85	18	0	63	93	104	0	66	114	48	0	14	192	87	0	934	4027
4:45 PM	49	54	18	0	66	102	116	0	87	182	54	0	27	262	98	0	1115	4152
5:00 PM	67	83	15	0	70	144	121	0	75	175	102	0	18	242	76	0	1188	4270
5:15 PM	62	57	18	0	72	116	130	0	94	179	66	0	17	236	97	0	1144	4381
5:30 PM	69	87	13	0	79	119	130	0	82	155	47	0	11	224	77	0	1093	4540
5:45 PM	66	82	7	0	74	113	113	0	92	189	72	0	20	241	92	0	1161	4586
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	268	332	60	0	280	576	484	0	300	700	408	0	72	968	304	0	4752	
Heavy Trucks	4	4	0	0	8	0	12	0	16	8	8	0	0	8	4	0	72	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: West End Ave/Concord Rd -- Kingston Pike
CITY/STATE: Knoxville, TN

QC JOB #: 13729562
DATE: Thu, Apr 14 2016

Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM



15-Min Count Period Beginning At	West End Ave/Concord Rd (Northbound)				West End Ave/Concord Rd (Southbound)				Kingston Pike (Eastbound)				Kingston Pike (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	13	46	77	0	24	8	17	0	30	122	4	0	17	63	44	0	465	
7:15 AM	24	79	128	0	52	15	34	0	56	182	9	0	10	105	71	0	765	
7:30 AM	36	48	149	0	68	24	34	0	41	247	5	0	17	124	43	0	836	
7:45 AM	44	66	112	0	97	26	36	0	42	245	11	0	27	134	45	0	885	2951
8:00 AM	47	85	93	0	75	22	41	0	60	210	19	0	32	106	52	0	842	3328
8:15 AM	42	61	94	0	82	23	48	0	36	178	19	0	39	101	51	0	774	3337
8:30 AM	20	10	111	0	28	16	18	0	9	205	7	0	31	124	15	0	594	3095
8:45 AM	14	9	103	0	20	4	6	0	9	203	7	0	30	132	9	0	546	2756

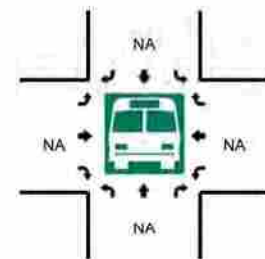
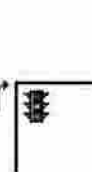
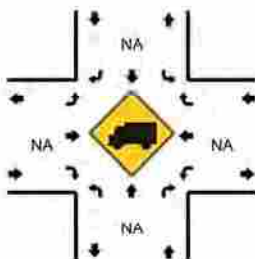
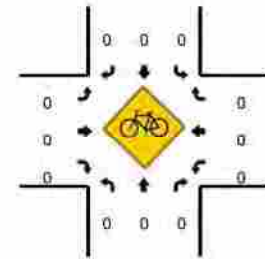
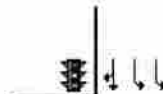
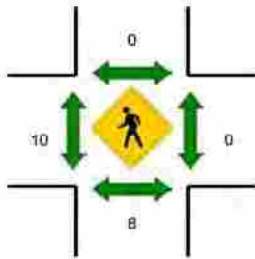
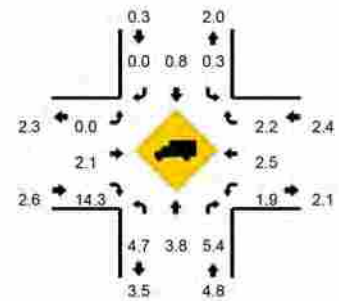
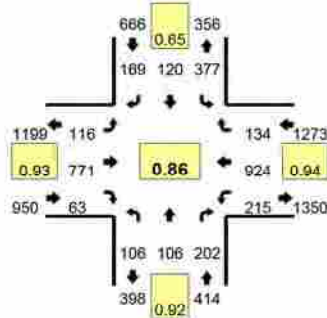
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	176	264	448	0	388	104	144	0	168	980	44	0	108	536	180	0	3540
Heavy Trucks	8	4	8	0	4	4	0	0	0	4	0	0	16	32	4	0	84
Pedestrians	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railroad																	
Stopped Buses																	

Comments:

LOCATION: West End Ave/Concord Rd -- Kingston Pike
CITY/STATE: Knoxville, TN

QC JOB #: 13729564
DATE: Thu, Apr 14 2016

Peak-Hour: 3:15 PM -- 4:15 PM
Peak 15-Min: 3:45 PM -- 4:00 PM



15-Min Count Period Beginning At	West End Ave/Concord Rd (Northbound)				West End Ave/Concord Rd (Southbound)				Kingston Pike (Eastbound)				Kingston Pike (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	20	12	45	0	33	15	23	0	18	199	9	0	45	230	32	0	681	
2:15 PM	25	18	61	0	24	10	18	0	30	168	11	0	45	206	22	0	638	
2:30 PM	11	17	49	0	26	14	14	0	29	189	9	0	54	226	33	0	671	
2:45 PM	15	16	54	0	43	30	53	0	19	173	10	0	53	218	29	0	713	2703
3:00 PM	14	24	56	0	34	12	27	0	31	203	7	0	40	206	41	0	695	2717
3:15 PM	30	38	47	0	41	21	14	0	34	189	11	0	42	222	55	0	744	2823
3:30 PM	25	31	40	0	119	33	68	0	36	194	21	0	49	223	27	0	866	3018
3:45 PM	28	20	59	0	159	40	59	0	24	223	21	0	68	233	30	0	964	3269
4:00 PM	23	17	56	0	58	26	28	0	22	165	10	0	56	246	22	0	729	3303
4:15 PM	17	15	57	0	32	22	21	0	10	196	10	0	71	247	21	0	719	3278
4:30 PM	25	10	61	0	27	21	35	0	11	155	14	0	67	242	19	0	687	3099
4:45 PM	26	14	45	0	23	26	22	0	9	184	13	0	64	284	19	0	729	2864
5:00 PM	36	14	63	0	25	12	7	0	6	207	6	0	79	276	15	0	746	2881
5:15 PM	21	18	59	0	25	16	16	0	9	218	9	0	94	259	21	0	765	2927
5:30 PM	28	20	55	0	31	19	20	0	15	184	11	0	92	293	26	0	794	3034
5:45 PM	23	13	68	0	24	15	22	0	12	212	11	0	89	279	21	0	789	3094

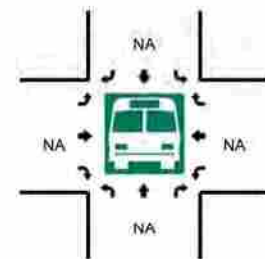
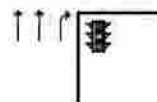
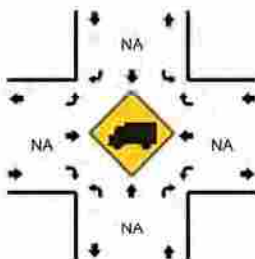
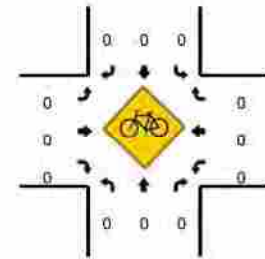
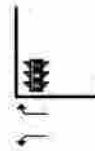
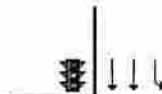
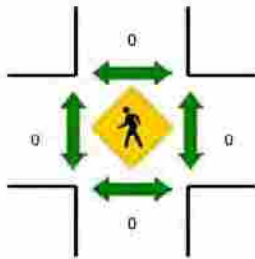
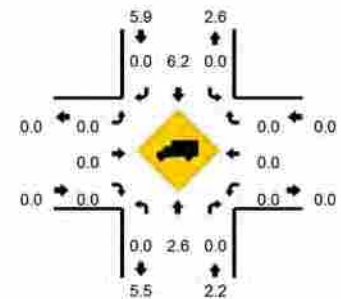
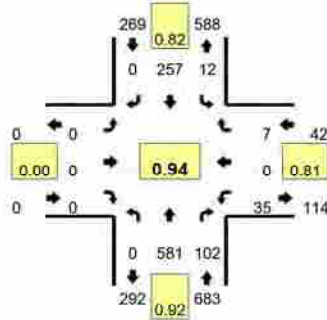
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	112	80	236	0	636	160	236	0	96	892	84	0	272	932	120	0	3856
Heavy Trucks	4	0	8	0	4	4	0	0	0	24	28	0	4	12	0	0	88
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments:

LOCATION: N Campbell Station -- Brooklawn St
CITY/STATE: Farragut, TN

QC JOB #: 13729507
DATE: Thu, Apr 14 2016

Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:30 AM -- 7:45 AM



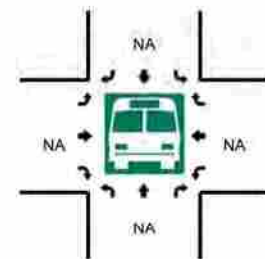
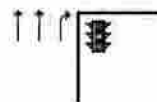
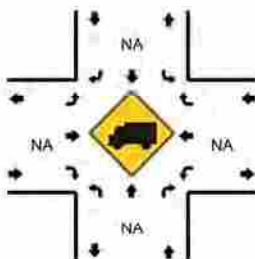
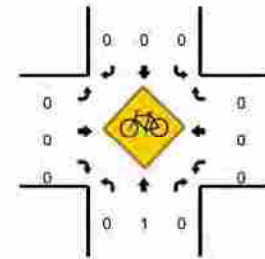
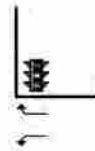
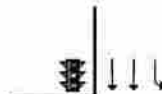
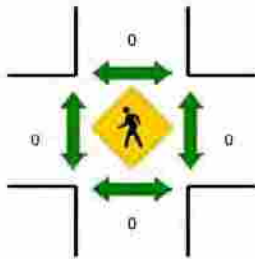
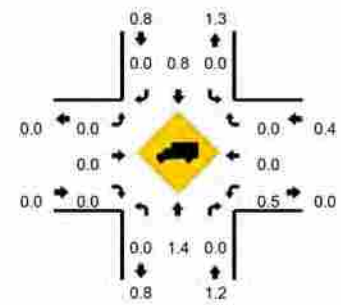
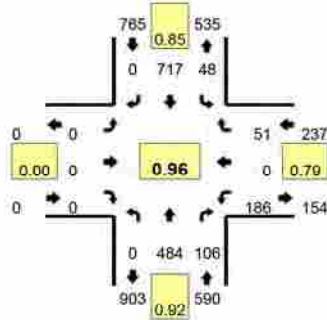
15-Min Count Period Beginning At	N Campbell Station (Northbound)				N Campbell Station (Southbound)				Brooklawn St (Eastbound)				Brooklawn St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	83	12	0	4	39	0	0	0	0	0	0	1	0	1	0	140	
7:15 AM	0	162	23	0	2	52	0	0	0	0	0	0	4	0	3	0	246	
7:30 AM	0	153	17	0	3	81	0	0	0	0	0	0	9	0	1	0	264	
7:45 AM	0	144	16	0	0	71	0	0	0	0	0	0	9	0	2	0	242	892
8:00 AM	0	122	46	0	7	53	0	0	0	0	0	0	13	0	1	0	242	994
8:15 AM	0	136	29	0	8	51	0	0	0	0	0	0	15	0	3	0	242	990
8:30 AM	0	153	9	0	6	64	0	0	0	0	0	0	12	0	1	0	245	971
8:45 AM	0	125	15	0	4	65	0	0	0	0	0	0	10	0	3	0	222	951
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	612	68	0	12	324	0	0	0	0	0	0	36	0	4	0	1056	
Heavy Trucks	0	16	0	0	0	8	0	0	0	0	0	0	0	0	0	0	24	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Comments:

LOCATION: N Campbell Station -- Brooklawn St
CITY/STATE: Farragut, TN

QC JOB #: 13729509
DATE: Thu, Apr 14 2016

Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

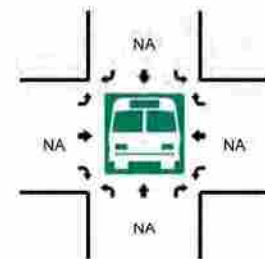
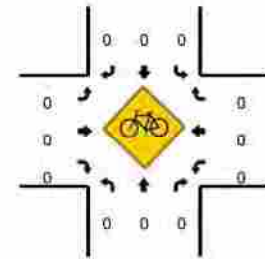
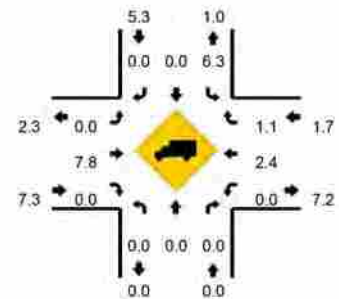


15-Min Count Period Beginning At	N Campbell Station (Northbound)				N Campbell Station (Southbound)				Brooklawn St (Eastbound)				Brooklawn St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	90	22	0	17	133	0	1	0	0	0	0	60	0	13	0	336	
4:15 PM	0	107	17	0	10	132	0	0	0	0	0	0	28	0	11	0	305	
4:30 PM	0	96	28	0	12	125	0	0	0	0	0	0	55	0	20	0	336	
4:45 PM	0	79	29	0	17	148	0	0	0	0	0	0	45	0	5	0	323	1300
5:00 PM	0	110	18	0	21	203	0	0	0	0	0	0	50	0	14	0	416	1380
5:15 PM	0	129	29	0	10	180	0	0	0	0	0	0	37	0	11	0	396	1471
5:30 PM	0	113	31	0	5	150	0	0	0	0	0	0	49	0	17	0	365	1500
5:45 PM	0	132	28	0	12	184	0	0	0	0	0	0	50	0	9	0	415	1592

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	440	72	0	84	812	0	0	0	0	0	0	200	0	56	0	1664
Heavy Trucks	0	8	0	0	0	12	0	0	0	0	0	0	0	0	0	0	20
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railroad																	
Stopped Buses																	

Comments:

QC JOB #: 13729510
DATE: Thu, Apr 14 2016

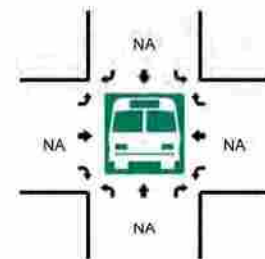
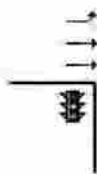
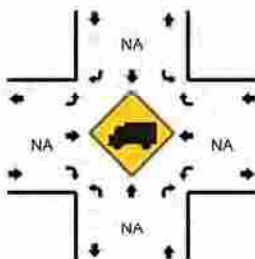
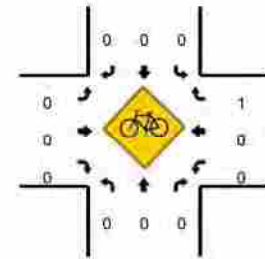
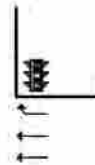
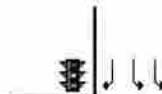
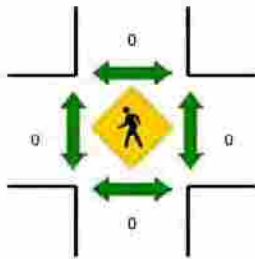
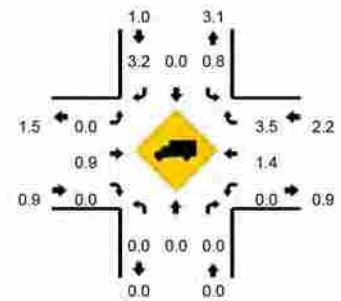
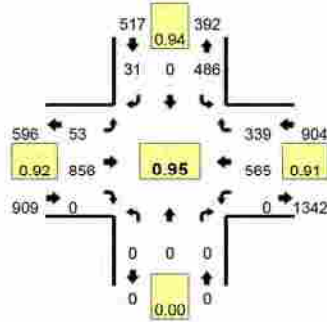
[illegible]

SOURCE: Quality Counts, LLC (<http://www.qualitycounts.net>) 1-877-580-2212

LOCATION: Concord Rd -- S Campbell Station Rd
CITY/STATE: Farragut, TN

QC JOB #: 13729512
DATE: Thu, Apr 14 2016

Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:15 PM -- 5:30 PM



15-Min Count Period Beginning At	Concord Rd (Northbound)				Concord Rd (Southbound)				S Campbell Station Rd (Eastbound)				S Campbell Station Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	107	0	11	0	21	168	0	0	0	100	77	0	484	
4:15 PM	0	0	0	0	89	0	11	0	7	174	0	0	0	117	73	0	471	
4:30 PM	0	0	0	0	104	0	12	0	17	163	0	0	0	107	75	0	478	
4:45 PM	0	0	0	0	84	0	9	0	13	181	0	0	0	102	88	0	477	1910
5:00 PM	0	0	0	0	123	0	10	0	12	236	0	0	0	134	76	0	591	2017
5:15 PM	0	0	0	0	132	0	5	0	15	215	0	0	0	150	97	0	614	2160
5:30 PM	0	0	0	0	127	0	9	0	10	195	0	0	0	135	88	0	564	2246
5:45 PM	0	0	0	0	104	0	7	0	16	210	0	0	0	146	78	0	561	2330

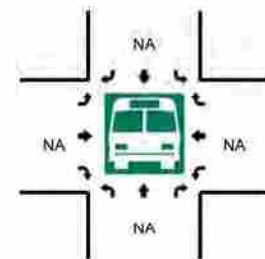
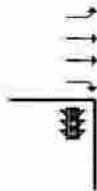
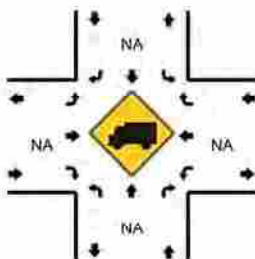
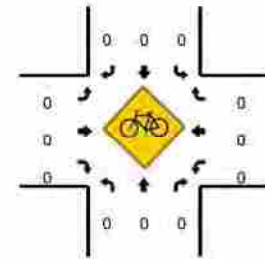
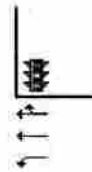
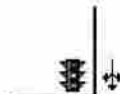
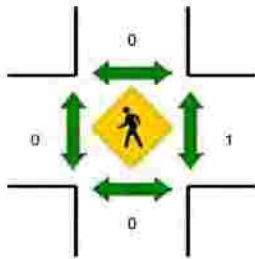
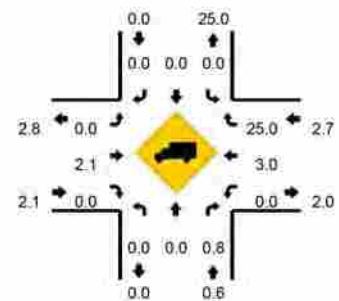
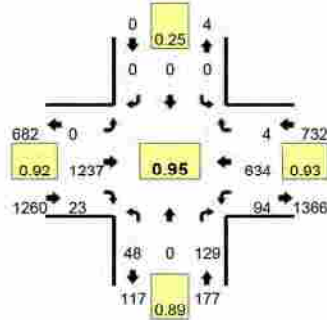
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	528	0	20	0	60	860	0	0	0	600	388	0	2456
Heavy Trucks	0	0	0	0	4	0	0	0	0	4	0	0	0	4	12	0	24
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments:

LOCATION: Brooklawn St -- Kingston Pike
CITY/STATE: Knoxville, TN

QC JOB #: 13729519
DATE: Thu, Apr 14 2016

Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM



15-Min Count Period Beginning At	Brooklawn St (Northbound)				Brooklawn St (Southbound)				Kingston Pike (Eastbound)				Kingston Pike (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	8	0	13	0	0	0	0	0	0	177	1	0	8	71	1	0	279	
7:15 AM	9	0	19	0	0	0	0	0	0	277	4	0	12	131	3	0	455	
7:30 AM	5	0	27	0	0	0	0	0	0	308	2	0	17	146	2	0	507	
7:45 AM	8	0	42	0	0	0	0	0	0	325	8	0	20	166	1	0	570	1811
8:00 AM	13	0	30	0	0	0	0	0	0	339	7	0	27	151	1	0	568	2100
8:15 AM	22	0	30	0	0	0	0	0	0	265	6	0	30	171	0	0	524	2169
8:30 AM	22	0	18	0	1	0	0	0	0	193	7	0	23	160	0	0	424	2086
8:45 AM	17	0	24	0	0	0	0	0	0	205	4	0	8	134	0	0	392	1908

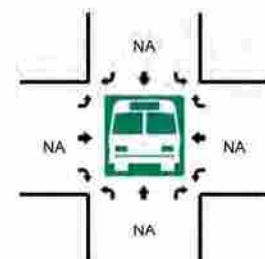
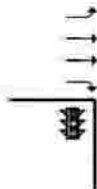
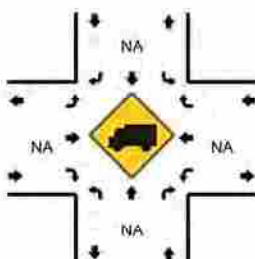
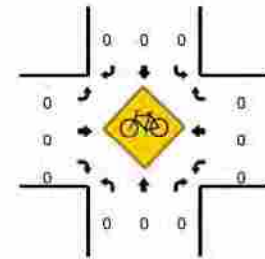
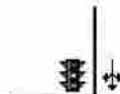
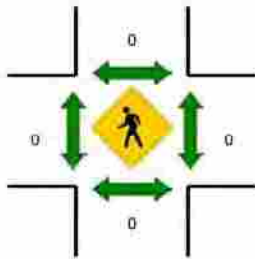
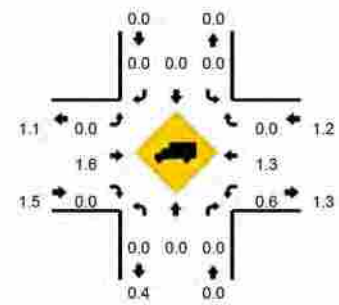
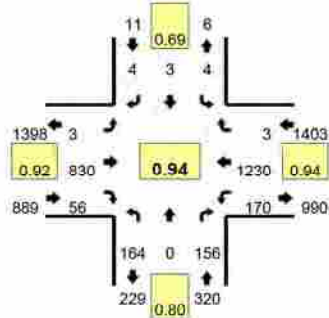
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	32	0	168	0	0	0	0	0	0	1300	32	0	80	664	4	0	2280
Heavy Trucks	0	0	4	0	0	0	0	0	0	28	0	0	0	16	0	0	48
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railroad																	
Stopped Buses																	

Comments:

LOCATION: Brooklawn St -- Kingston Pike
CITY/STATE: Knoxville, TN

QC JOB #: 13729521
DATE: Thu, Apr 14 2016

Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:45 PM -- 6:00 PM



15-Min Count Period Beginning At	Brooklawn St (Northbound)				Brooklawn St (Southbound)				Kingston Pike (Eastbound)				Kingston Pike (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	38	0	36	0	0	0	0	0	1	175	15	0	57	310	1	0	633	
4:15 PM	63	2	38	0	0	0	2	0	0	185	11	0	47	277	1	0	626	
4:30 PM	51	0	25	0	0	1	1	0	0	165	7	0	41	273	0	0	564	
4:45 PM	44	2	24	0	0	1	0	0	2	221	10	0	37	328	0	0	669	2492
5:00 PM	44	0	38	0	1	1	2	0	2	215	13	0	32	296	2	0	646	2505
5:15 PM	39	0	33	0	1	0	1	0	0	209	15	0	42	300	1	0	641	2520
5:30 PM	37	0	49	0	2	1	0	0	0	180	14	0	46	312	0	0	641	2597
5:45 PM	44	0	36	0	0	1	1	0	1	226	14	0	50	322	0	0	695	2623

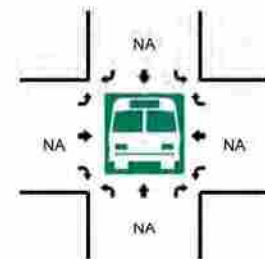
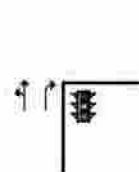
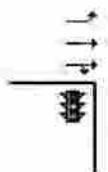
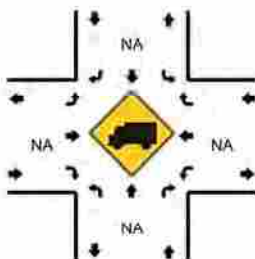
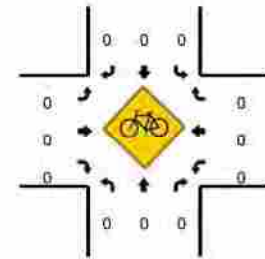
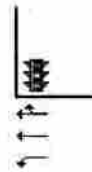
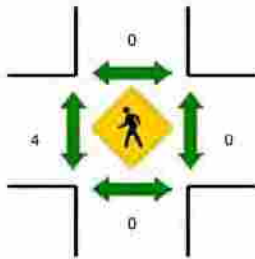
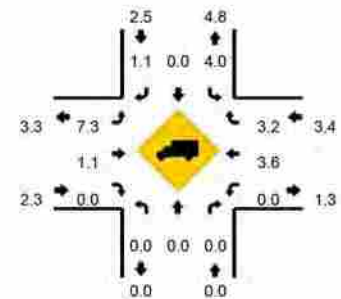
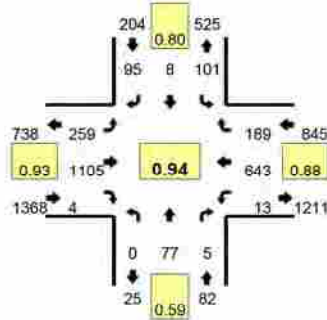
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	176	0	144	0	0	4	4	0	4	904	56	0	200	1288	0	0	2780
Heavy Trucks	0	0	0	0	0	0	0	0	0	8	0	0	0	8	0	0	16
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railroad																	
Stopped Buses																	

Comments:

LOCATION: Lendon Welsh Way – Kingston Pike
CITY/STATE: Farragut, TN

QC JOB #: 13729565
DATE: Thu, Apr 14 2016

Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 8:00 AM -- 8:15 AM



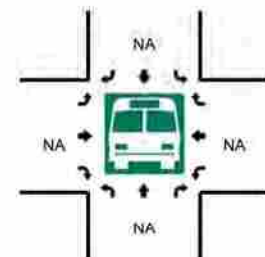
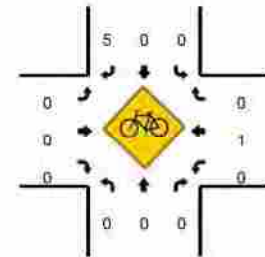
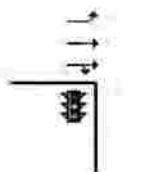
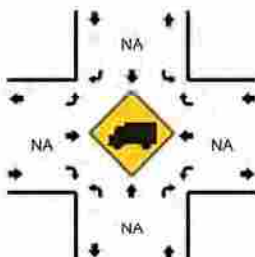
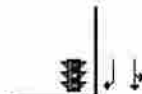
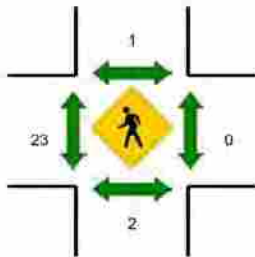
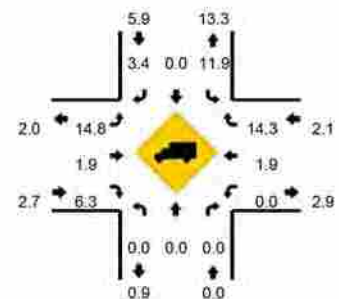
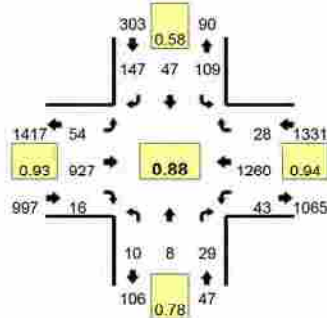
15-Min Count Period Beginning At	Lendon Welsh Way (Northbound)				Lendon Welsh Way (Southbound)				Kingston Pike (Eastbound)				Kingston Pike (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	3	1	6	0	14	167	0	0	1	78	7	0	277	
7:15 AM	0	1	1	0	15	0	6	0	41	257	2	0	0	144	26	0	493	
7:30 AM	0	3	0	0	23	0	13	0	54	282	0	0	2	154	39	0	570	
7:45 AM	0	11	2	0	25	1	20	0	47	314	1	0	3	175	62	0	661	2001
8:00 AM	0	34	1	0	23	3	32	0	82	283	1	0	5	147	51	0	662	2386
8:15 AM	0	29	2	0	30	4	30	0	76	226	2	0	3	167	37	0	606	2499
8:30 AM	0	0	2	0	11	0	9	0	2	215	2	0	2	173	8	0	424	2353
8:45 AM	1	0	3	0	1	0	4	0	7	218	3	0	3	142	2	0	384	2076
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	136	4	0	92	12	128	0	328	1132	4	0	20	588	204	0	2648	
Heavy Trucks	0	0	0		12	0	0		8	12	0		0	32	0		64	
Pedestrians	0	0			0	0			12				0	0			12	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: Lendon Welsh Way – Kingston Pike
CITY/STATE: Farragut, TN

QC JOB #: 13729567
DATE: Thu, Apr 14 2016

Peak-Hour: 3:15 PM – 4:15 PM
Peak 15-Min: 3:45 PM – 4:00 PM



15-Min Count Period Beginning At	Lendon Welsh Way (Northbound)				Lendon Welsh Way (Southbound)				Kingston Pike (Eastbound)				Kingston Pike (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	1	0	8	0	10	3	24	0	3	231	4	0	5	279	3	0	571	
2:15 PM	3	1	7	0	4	0	7	0	5	219	1	0	4	249	2	0	502	
2:30 PM	4	1	2	0	4	0	3	0	7	224	4	0	7	257	1	0	514	
2:45 PM	3	0	1	0	9	0	6	0	2	217	1	0	6	315	2	0	562	2149
3:00 PM	0	1	5	0	5	0	3	0	11	249	2	0	8	248	2	0	534	2112
3:15 PM	2	3	7	0	8	1	6	0	24	253	6	0	9	236	12	0	567	2177
3:30 PM	2	2	5	0	51	24	56	0	15	242	4	0	14	310	6	0	731	2394
3:45 PM	2	2	11	0	40	17	65	0	12	227	3	0	15	365	5	0	764	2596
4:00 PM	4	1	6	0	10	5	20	0	3	205	3	0	5	349	5	0	616	2678
4:15 PM	3	1	6	0	5	1	10	0	7	212	5	0	9	296	2	0	557	2668
4:30 PM	7	0	4	0	3	2	21	0	8	177	4	0	8	302	3	0	539	2476
4:45 PM	2	0	7	0	4	0	16	0	10	227	6	0	5	334	8	0	619	2331
5:00 PM	4	0	6	0	6	0	8	0	3	255	0	0	3	319	5	0	609	2324
5:15 PM	4	0	2	0	1	0	10	0	11	231	2	0	7	318	5	0	591	2358
5:30 PM	6	1	8	0	5	2	13	2	13	214	5	0	11	347	12	0	639	2458
5:45 PM	2	1	3	0	3	3	17	1	6	253	4	0	8	348	6	0	655	2494

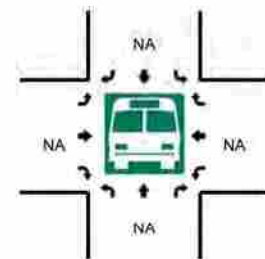
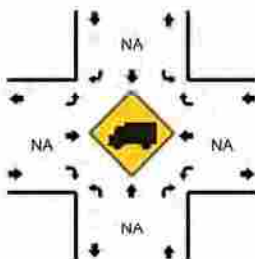
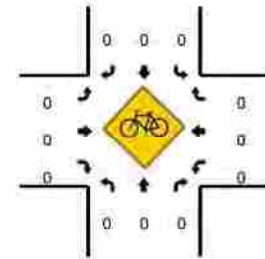
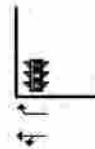
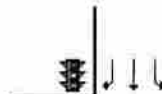
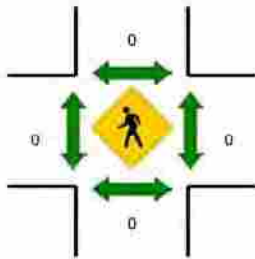
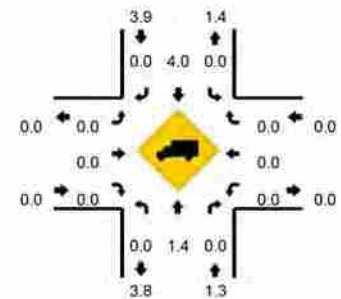
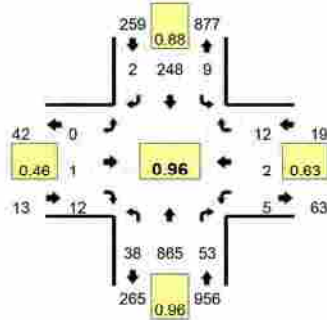
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	8	8	44	0	160	68	260	0	48	908	12	0	60	1460	20	0	3056
Heavy Trucks	0	0	0	0	32	0	12	0	12	16	0	0	0	20	0	0	92
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Bicycles	0	0	0	0	0	0	5	0	0	0	0	0	0	1	0	0	6
Railroad																	
Stopped Buses																	

Comments:

LOCATION: Concord Rd -- Shopping Center Dr/Old Kroger Dr
CITY/STATE: Farragut, TN

QC JOB #: 13729516
DATE: Thu, Apr 14 2016

Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 8:00 AM -- 8:15 AM



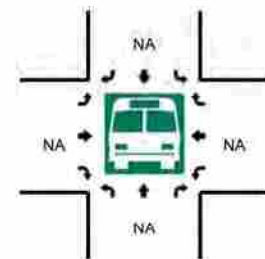
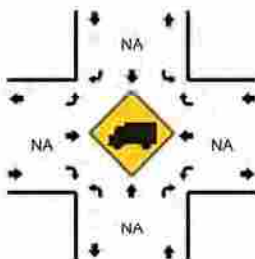
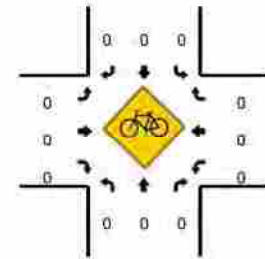
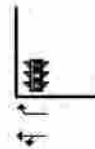
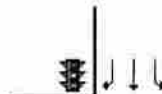
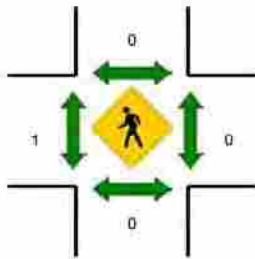
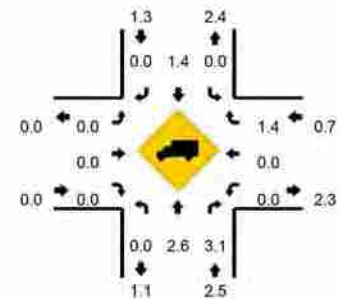
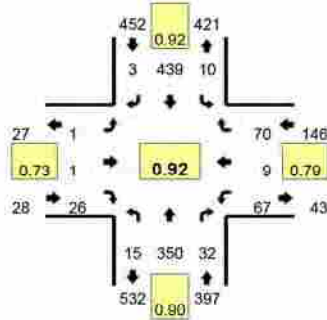
15-Min Count Period Beginning At	Concord Rd (Northbound)				Concord Rd (Southbound)				Shopping Center Dr/Old Kroger Dr (Eastbound)				Shopping Center Dr/Old Kroger Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	1	144	4	0	3	24	1	0	0	0	1	0	2	0	3	0	183	
7:15 AM	2	224	15	0	3	31	1	0	0	1	1	0	0	0	3	0	281	
7:30 AM	4	229	23	0	0	45	1	0	0	1	1	0	0	2	6	0	312	
7:45 AM	10	222	11	0	2	62	0	0	0	0	1	0	2	0	2	0	312	1088
8:00 AM	15	225	8	0	3	68	1	0	0	0	3	0	1	0	2	0	326	1231
8:15 AM	9	189	11	0	4	73	0	0	0	0	7	0	2	0	2	0	297	1247
8:30 AM	2	135	14	0	6	51	0	0	0	0	0	0	4	0	6	0	218	1153
8:45 AM	1	110	8	0	1	37	0	0	1	0	2	0	2	1	5	0	168	1009
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	60	900	32	0	12	272	4	0	0	0	12	0	4	0	8	0	1304	
Heavy Trucks	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Comments:

LOCATION: Concord Rd -- Shopping Center Dr/Old Kroger Dr
CITY/STATE: Farragut, TN

QC JOB #: 13729518
DATE: Thu, Apr 14 2016

Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:15 PM -- 5:30 PM



15-Min Count Period Beginning At	Concord Rd (Northbound)				Concord Rd (Southbound)				Shopping Center Dr/Old Kroger Dr (Eastbound)				Shopping Center Dr/Old Kroger Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	93	7	0	1	90	0	0	0	2	5	0	10	2	2	0	212	
4:15 PM	1	78	6	0	4	99	0	0	0	1	3	0	10	5	5	0	212	
4:30 PM	2	85	8	0	8	90	1	0	0	0	11	0	8	1	1	0	215	
4:45 PM	8	83	3	0	3	97	2	0	1	0	5	0	11	1	1	0	215	854
5:00 PM	4	78	6	0	4	90	2	0	0	0	8	0	18	2	23	0	235	877
5:15 PM	5	88	10	0	2	121	0	0	0	0	7	0	23	1	22	0	279	944
5:30 PM	4	86	6	0	3	116	1	0	0	0	6	0	7	6	11	0	246	975
5:45 PM	2	98	10	0	1	112	0	0	1	1	5	0	19	0	14	0	263	1023

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	20	352	40	0	8	484	0	0	0	0	28	0	92	4	88	0	1116
Heavy Trucks	0	4	4	0	0	0	0	0	0	0	0	0	0	0	4	0	12
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Railroad																	
Stopped Buses																	

Comments:

Project ID: 20-190014-002
 Location: Brooklawn St & Petco Dwy/Old Kroger Access Dwy
 City: Knoxville

Day: Tuesday
 Date: 10/06/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

	Brooklawn St Northbound						Brooklawn St Southbound						Petco Dwy/Old Kroger Access Dwy Eastbound						Petco Dwy/Old Kroger Access Dwy Westbound							
Start Time	Left	Thru	Rgt	Uturn	Peds	App.Total	Left	Thru	Rgt	Uturn	Peds	App.Total	Left	Thru	Rgt	Uturn	Peds	App.Total	Left	Thru	Rgt	Uturn	Peds	App.Total	Int. Total	
7:00 AM	0	4	1	0	0	5	0	1	1	0	0	2	3	0	0	0	0	3	0	0	0	0	0	0	10	
7:15 AM	2	6	0	0	0	8	0	6	7	0	0	13	8	2	1	0	0	11	0	0	0	0	0	0	32	
7:30 AM	1	5	5	0	0	11	0	7	6	0	0	13	8	0	0	0	0	8	1	1	1	0	0	3	35	
7:45 AM	3	7	9	0	0	19	5	8	10	0	0	23	9	2	1	0	0	12	1	2	1	0	0	4	58	
Total	6	22	15	0	0	43	5	22	24	0	0	51	28	4	2	0	0	34	2	3	2	0	0	7	135	
8:00 AM	1	9	11	0	0	21	2	16	11	1	0	30	11	0	0	0	0	11	1	0	1	0	0	2	64	
8:15 AM	4	11	7	0	0	22	2	21	7	0	0	30	17	1	1	0	0	19	1	0	3	0	0	4	75	
8:30 AM	1	5	1	0	0	7	0	10	4	0	0	14	14	0	4	0	0	18	3	0	0	0	0	3	42	
8:45 AM	1	5	1	0	0	7	0	9	6	0	0	15	18	1	0	0	1	19	0	1	1	0	0	2	43	
Total	7	30	20	0	0	57	4	56	28	1	0	89	60	2	5	0	1	67	5	1	5	0	0	11	224	
BREAK																										
3:00 PM	5	6	5	0	0	16	1	16	21	0	0	38	32	1	2	0	0	35	5	1	7	0	0	13	102	
3:15 PM	5	27	9	0	0	41	6	20	8	0	0	34	42	3	6	0	0	51	2	5	2	0	0	9	135	
3:30 PM	5	21	8	0	0	34	13	38	14	0	0	65	37	5	6	0	0	48	21	2	10	0	0	33	180	
3:45 PM	4	13	0	0	0	17	2	30	18	0	0	50	44	0	5	0	0	49	16	9	13	0	0	38	154	
Total	19	67	22	0	0	108	22	104	61	0	0	187	155	9	19	0	0	183	44	17	32	0	0	93	571	
4:00 PM	2	21	1	0	0	24	1	23	23	0	0	47	36	1	7	0	0	44	1	2	3	0	0	6	121	
4:15 PM	7	17	0	0	0	24	1	20	9	0	0	30	30	1	7	0	0	38	1	2	1	0	0	4	96	
4:30 PM	4	19	0	0	0	23	3	17	13	0	0	33	29	1	3	0	0	33	3	3	1	0	0	7	96	
4:45 PM	6	13	0	0	2	19	3	28	19	0	0	50	38	1	5	0	0	44	5	1	1	0	1	7	120	
Total	19	70	1	0	2	90	8	88	64	0	0	165	133	4	22	0	0	159	10	8	6	0	1	24	433	
5:00 PM	5	16	2	0	0	23	2	18	20	0	0	40	31	1	10	0	0	42	1	4	3	0	0	8	113	
5:15 PM	8	8	0	0	0	16	0	12	16	0	0	28	30	3	1	0	0	34	5	2	0	0	0	7	85	
5:30 PM	3	18	0	0	0	21	3	32	10	0	0	45	34	1	8	0	0	43	5	4	1	0	0	10	119	
5:45 PM	0	12	2	0	0	14	0	31	20	1	0	52	29	5	6	0	0	40	2	2	1	0	0	5	111	
Total	16	54	4	0	0	74	5	93	66	1	0	165	124	10	25	0	0	159	13	12	5	0	0	30	428	
Grand Total	67	243	62	0	2	372	44	363	243	2	0	652	500	29	73	0	1	602	74	41	50	0	1	165	1791	
Approch %	18.0	65.3	16.7	0.0	0.5		6.7	55.7	37.3	0.3	0.0		83.1	4.8	12.1	0.0	0.2		44.8	24.8	30.3	0.0	0.6			
Total %	3.7	13.6	3.5	0.0	0.1	20.8	2.5	20.3	13.6	0.1	0.0	36.4	27.9	1.6	4.1	0.0	0.1	33.6	4.1	2.3	2.8	0.0	0.1	9.2		
Cars, PU, Vans	67	243	61	0	0	371	44	355	241	2	0	642	496	29	73	0	0	598	74	41	50	0	0	165	1776	
% Cars, PU, Vans	100.0	100.0	98.4	0.0	0.0	99.7	100.0	97.8	99.2	100.0	0.0	98.5	99.2	100.0	100.0	0.0	0.0	99.3	100.0	100.0	100.0	0.0	0.0	100.0	99.2	
Heavy Trucks	0	0	1	0	0	1	0	8	2	0	0	10	4	0	0	0	0	4	0	0	0	0	0	0	15	
% Heavy Trucks	0.0	0.0	1.6	0.0	0.3	0.3	0.0	2.2	0.8	0.0	1.5	0.8	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	

Project ID: 20-190014-002
 Location: Brooklawn St & Petco Dwy/Old Kroger Access Dwy
 City: Knoxville

PEAK HOURS

Day: Tuesday
 Date: 10/06/2020

AM

	Brooklawn St Northbound						Brooklawn St Southbound						Petco Dwy/Old Kroger Access Dwy Eastbound						Petco Dwy/Old Kroger Access Dwy Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 07:00 AM to 09:00 AM																								
Peak Hour for Entire Intersection Begins at 07:45 AM																								
7:45 AM	3	7	9	0	19		5	8	10	0	23		9	2	1	0	12		1	2	1	0	4	58
8:00 AM	1	9	11	0	21		2	16	11	1	30		11	0	0	0	11		1	0	1	0	2	64
8:15 AM	4	11	7	0	22		2	21	7	0	30		17	1	1	0	19		1	0	3	0	4	75
8:30 AM	1	5	1	0	7		0	10	4	0	14		14	0	4	0	18		3	0	0	0	3	42
Total Volume	9	32	28	0	69		9	55	32	1	97		51	3	6	0	60		6	2	5	0	13	239
% App. Total	13.0	46.4	40.6	0.0	100		9.3	56.7	33.0	1.0	100		85.0	5.0	10.0	0.0	100		46.2	15.4	38.5	0.0	100	
PHF	0.784						0.808						0.789						0.813					0.797
Cars, PU, Vans	9	32	28	0	69		9	54	32	1	96		50	3	6	0	59		6	2	5	0	13	237
% Cars, PU, Vans	100.0	100.0	100.0	0.0	100.0		100.0	98.2	100.0	100.0	99.0		98.0	100.0	100.0	0.0	98.3		100.0	100.0	100.0	0.0	100.0	99.2
Heavy Trucks	0	0	0	0	0		0	1	0	0	1		1	0	0	0	1		0	0	0	0	0	2
% Heavy Trucks	0.0	0.0	0.0	0.0	0.0		0.0	1.8	0.0	0.0	1.0		2.0	0.0	0.0	0.0	1.7		0.0	0.0	0.0	0.0	0.0	0.8

PM

	Brooklawn St Northbound						Brooklawn St Southbound						Petco Dwy/Old Kroger Access Dwy Eastbound						Petco Dwy/Old Kroger Access Dwy Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 03:00 PM to 06:00 PM																								
Peak Hour for Entire Intersection Begins at 03:15 PM																								
3:15 PM	5	27	9	0	41		6	20	8	0	34		42	3	6	0	51		2	5	2	0	9	135
3:30 PM	5	21	8	0	34		13	38	14	0	65		37	5	6	0	48		21	2	10	0	33	180
3:45 PM	4	13	0	0	17		2	30	18	0	50		44	0	5	0	49		16	9	13	0	38	154
4:00 PM	2	21	1	0	24		1	23	23	0	47		36	1	7	0	44		1	2	3	0	6	121
Total Volume	16	82	18	0	116		22	111	63	0	196		159	9	24	0	192		40	18	28	0	86	590
% App. Total	13.8	70.7	15.5	0.0	100		11.2	56.6	32.1	0.0	100		82.8	4.7	12.5	0.0	100		46.5	20.9	32.6	0.0	100	
PHF	0.707						0.754						0.941						0.566					0.819
Cars, PU, Vans	16	82	17	0	115		22	106	63	0	191		159	9	24	0	192		40	18	28	0	86	584
% Cars, PU, Vans	100.0	100.0	94.4	0.0	99.1		100.0	95.5	100.0	0.0	97.4		100.0	100.0	100.0	0.0	100.0		100.0	100.0	100.0	0.0	100.0	99.0
Heavy Trucks	0	0	1	0	1		0	5	0	0	5		0	0	0	0	0		0	0	0	0	0	6
% Heavy Trucks	0.0	0.0	5.6	0.0	0.9		0.0	4.5	0.0	0.0	2.6		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	1

Project ID: 20-190014-003
 Location: Brooklawn St & Kroger Marketplace Roundabout Dwy
 City: Knoxville

Day: Tuesday
 Date: 10/06/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Brooklawn St Northbound						Brooklawn St Southbound						Kroger Marketplace Roundabout Dwy Eastbound						Kroger Marketplace Roundabout Dwy Westbound						Int. Total
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	
7:00 AM	1	5	0	0	0	6	0	1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	5
7:15 AM	2	8	0	0	0	10	0	2	5	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	17
7:30 AM	1	11	0	0	0	12	0	4	3	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	19
7:45 AM	1	19	0	0	0	20	0	7	4	0	0	11	0	0	1	0	0	1	0	0	0	0	0	0	32
Total	5	43	0	0	0	48	0	14	12	0	0	26	0	0	2	0	0	2	0	0	0	0	0	0	76
8:00 AM	0	21	0	0	0	21	0	15	2	0	0	17	0	0	4	0	0	4	0	0	0	0	0	0	42
8:15 AM	1	19	0	0	0	20	0	16	7	0	0	23	3	0	0	0	0	3	0	0	0	0	0	0	46
8:30 AM	2	7	0	0	0	9	0	12	5	0	0	17	0	0	2	0	0	2	0	0	0	0	0	0	28
8:45 AM	0	7	0	0	0	7	0	3	5	0	0	8	0	0	1	0	0	1	0	0	0	0	0	0	16
Total	3	54	0	0	0	57	0	46	19	0	0	65	3	0	7	0	0	10	0	0	0	0	0	0	132
BREAK																									
3:00 PM	6	14	0	0	0	20	0	16	8	0	0	24	4	0	12	0	0	16	0	0	0	0	0	0	60
3:15 PM	8	34	0	0	0	42	0	20	7	0	0	27	5	0	12	0	0	17	0	0	0	0	0	0	86
3:30 PM	2	27	0	0	0	29	0	53	12	1	0	66	9	0	14	0	0	23	0	0	0	0	0	0	118
3:45 PM	4	10	0	0	0	14	0	42	10	0	0	52	5	0	15	0	0	20	0	0	0	0	0	0	86
Total	20	85	0	0	0	105	0	131	37	1	0	169	23	0	53	0	0	76	0	0	0	0	0	0	350
4:00 PM	5	17	0	0	0	22	0	19	11	0	0	30	7	0	6	0	0	13	0	0	0	0	0	0	65
4:15 PM	4	16	0	0	0	20	0	20	9	0	0	29	7	0	10	0	0	17	0	0	0	0	0	0	66
4:30 PM	6	16	0	0	0	22	0	15	8	0	0	23	7	0	12	0	0	19	0	0	0	0	0	0	64
4:45 PM	3	14	0	0	1	17	0	24	13	0	0	37	4	0	18	0	2	22	0	0	0	0	0	0	76
Total	18	63	0	0	1	81	0	78	41	0	0	119	25	0	46	0	2	71	0	0	0	0	0	0	271
5:00 PM	6	14	0	1	0	21	0	21	9	0	0	30	9	0	14	0	0	23	0	0	0	0	0	0	74
5:15 PM	3	14	0	0	0	17	0	10	8	0	0	18	3	0	11	0	0	14	0	0	0	0	0	0	49
5:30 PM	5	11	0	0	0	16	0	30	12	1	0	43	10	0	18	0	0	28	0	0	0	0	0	0	87
5:45 PM	2	8	0	1	0	11	0	32	8	0	0	40	5	0	18	0	0	23	0	0	0	0	0	0	74
Total	16	47	0	2	0	65	0	93	37	1	0	131	27	0	61	0	0	88	0	0	0	0	0	0	284
Grand Total	62	292	0	2	1	356	0	362	146	2	0	510	78	0	169	0	2	247	0	0	0	0	0	0	1113
Approch %	17.4	82.0	0.0	0.6	0.3		0.0	71.0	28.6	0.4	0.0		31.6	0.0	68.4	0.0	0.8		0.0	0.0	0.0	0.0	0.0	0.0	
Total %	5.6	26.2	0.0	0.2	0.1	32.0	0.0	32.5	13.1	0.2	0.0	45.8	7.0	0.0	15.2	0.0	0.2	22.2	0.0	0.0	0.0	0.0	0.0	0.0	
Cars, PU, Vans	62	291	0	2		355	0	355	144	2		501	78	0	169	0		247	0	0	0	0	0	0	1103
% Cars, PU, Vans	100.0	99.7	0.0	100.0		99.7	0.0	98.1	98.6	100.0		98.2	100.0	0.0	100.0	0.0		100.0	0.0	0.0	0.0	0.0	0.0	0.0	99.1
Heavy Trucks	0	1	0	0		1	0	7	2	0		9	0	0	0	0		0	0	0	0	0	0	0	10
% Heavy Trucks	0.0	0.3	0.0	0.0		0.3	0.0	1.9	1.4	0.0		1.8	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9

Project ID: 20-190014-003
 Location: Brooklawn St & Kroger Marketplace Roundabout Dwy
 City: Knoxville

PEAK HOURS

Day: Tuesday
 Date: 10/06/2020

AM

	Brooklawn St Northbound					Brooklawn St Southbound					Kroger Marketplace Roundabout Dwy Eastbound					Kroger Marketplace Roundabout Dwy Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 07:00 AM to 09:00 AM																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
7:45 AM	1	19	0	0	20	0	7	4	0	11	0	0	1	0	1	0	0	0	0	0	32
8:00 AM	0	21	0	0	21	0	15	2	0	17	0	0	4	0	4	0	0	0	0	0	42
8:15 AM	1	19	0	0	20	0	16	7	0	23	3	0	0	0	3	0	0	0	0	0	46
8:30 AM	2	7	0	0	9	0	12	5	0	17	0	0	2	0	2	0	0	0	0	0	28
Total Volume	4	66	0	0	70	0	50	18	0	68	3	0	7	0	10	0	0	0	0	0	148
% App. Total	5.7	94.3	0.0	0.0	100	0.0	73.5	26.5	0.0	100	30.0	0.0	70.0	0.0	100	0.0	0.0	0.0	0.0	0.0	
PHF	0.833					0.739					0.625					0.804					
Cars, PU, Vans	4	66	0	0	70	0	50	17	0	67	3	0	7	0	10	0	0	0	0	0	147
% Cars, PU, Vans	100.0	100.0	0.0	0.0	100.0	0.0	100.0	94.4	0.0	98.5	100.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	99.3
Heavy Trucks	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
% Heavy Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7

PM

	Brooklawn St. Northbound					Brooklawn St. Southbound					Kroger Marketplace Roundabout Dwy. Eastbound					Kroger Marketplace Roundabout Dwy. Westbound					
Start Time	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Left	Thru	Rgt	Uturn	App. Total	Int. Total
Peak Hour Analysis from 03:00 PM to 06:00 PM																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
3:15 PM	6	34	0	0	42	0	20	7	0	27	5	0	12	0	17	0	0	0	0	0	86
3:30 PM	2	27	0	0	29	0	53	12	1	66	9	0	14	0	23	0	0	0	0	0	118
3:45 PM	4	10	0	0	14	0	42	10	0	52	5	0	15	0	20	0	0	0	0	0	86
4:00 PM	5	17	0	0	22	0	19	11	0	30	7	0	6	0	13	0	0	0	0	0	65
Total Volume	19	88	0	0	107	0	134	40	1	175	26	0	47	0	73	0	0	0	0	0	355
% App. Total	17.8	82.2	0.0	0.0	100	0.0	76.6	22.9	0.8	100	35.6	0.0	64.4	0.0	100	0.0	0.0	0.0	0.0	0.0	
PHF	0.637					0.663					0.793										0.752
Cars, PU, Vans	19	87	0	0	106	0	129	40	1	170	26	0	47	0	73	0	0	0	0	0	349
% Cars, PU, Vans	100.0	98.9	0.0	0.0	99.1	0.0	96.3	100.0	100.0	97.1	100.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	98.3
Heavy Trucks	0	1	0	0	1	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	6
% Heavy Trucks	0.0	1.1	0.0	0.0	0.9	0.0	3.7	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7

Project ID: 20-190014-004
 Location: Brooklawn St & Kroger Truck Ent Southern Dwy/Pinnacle Access
 City: Knoxville

Day: Tuesday
 Date: 10/06/2020

Groups Printed - Cars, PU, Vans - Heavy Trucks

Start Time	Brooklawn St Northbound						Brooklawn St Southbound						Kroger Truck Ent Southern Dwy/Pinnacle Access Eastbound						Kroger Truck Ent Southern Dwy/Pinnacle Access Westbound						Int. Total
	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	Left	Thru	Rgt	Uturn	Peds	App. Total	
7:00 AM	2	6	0	0	0	8	0	1	1	0	0	2	0	0	2	0	0	2	0	0	0	0	0	0	12
7:15 AM	4	10	0	0	0	14	0	2	0	0	0	2	0	0	3	0	0	3	0	0	0	0	0	0	19
7:30 AM	2	12	0	0	0	14	0	4	0	0	0	4	0	0	4	0	0	4	0	0	0	0	0	0	22
7:45 AM	11	20	0	0	0	31	0	8	0	0	0	8	0	0	3	0	0	3	0	0	0	0	0	0	42
Total	19	48	0	0	0	67	0	15	1	0	0	16	0	0	12	0	0	12	0	0	0	0	0	0	95
8:00 AM	17	23	0	0	0	40	0	17	2	0	0	19	0	0	10	0	0	10	0	0	0	0	0	0	69
8:15 AM	11	10	0	0	0	29	0	15	0	0	2	15	0	0	6	0	0	6	0	0	0	0	0	0	52
8:30 AM	12	9	0	0	0	21	0	13	1	0	0	14	0	0	8	0	0	8	0	0	0	0	0	0	43
8:45 AM	12	7	0	0	0	19	0	4	1	0	0	5	0	0	11	0	0	11	0	0	0	0	0	0	35
Total	52	57	0	0	0	109	0	49	4	0	2	53	0	0	37	0	0	37	0	0	0	0	0	0	199
BREAK																									
3:00 PM	18	20	0	0	0	38	0	26	3	0	0	29	0	0	21	0	0	21	2	0	0	0	0	2	90
3:15 PM	23	41	0	0	0	64	0	29	2	0	0	31	1	0	20	0	0	21	0	0	0	0	0	0	116
3:30 PM	20	26	0	0	0	46	0	61	2	0	0	63	3	0	14	0	0	17	0	0	0	0	0	0	126
3:45 PM	18	15	0	0	0	33	0	59	1	0	0	60	0	0	16	0	0	16	0	0	0	0	0	0	109
Total	79	102	0	0	0	181	0	175	8	0	0	183	4	0	71	0	0	75	2	0	0	0	2	2	441
4:00 PM	25	19	0	0	0	44	0	24	2	0	0	26	2	0	13	0	0	15	0	0	0	0	0	0	85
4:15 PM	18	18	0	0	0	36	0	26	3	0	0	29	2	0	21	0	0	23	0	0	0	0	0	0	88
4:30 PM	24	18	0	0	0	42	1	25	3	0	0	29	4	0	25	0	0	29	0	1	0	0	0	1	101
4:45 PM	24	16	0	0	0	40	0	37	5	0	2	42	2	0	22	0	0	24	0	0	0	0	0	0	106
Total	91	71	0	0	0	162	1	112	13	0	2	126	10	0	81	0	0	91	0	1	0	0	0	1	380
5:00 PM	17	19	0	0	0	36	0	33	2	0	0	35	1	0	26	0	2	27	0	0	0	0	0	0	98
5:15 PM	23	17	0	0	0	40	0	21	1	0	0	22	1	0	23	0	0	24	0	0	0	0	0	0	86
5:30 PM	19	15	0	0	0	34	0	46	1	0	0	47	0	0	19	0	0	19	0	0	0	0	0	0	100
5:45 PM	21	11	0	0	0	32	0	52	0	0	0	52	0	0	26	0	0	26	0	0	0	0	0	0	110
Total	80	62	0	0	0	142	0	152	4	0	0	156	2	0	94	0	2	96	0	0	0	0	0	0	394
Grand Total	321	340	0	0	0	661	1	503	30	0	4	534	16	0	295	0	2	311	2	1	0	0	0	3	1509
Approch %	48.6	51.4	0.0	0.0	0.0		0.2	94.2	5.6	0.0	0.7		5.1	0.0	94.9	0.0	0.6		66.7	33.3	0.0	0.0	0.0		
Total %	21.3	22.5	0.0	0.0	0.0	43.8	0.1	33.3	2.0	0.0	0.3	35.4	1.1	0.0	19.5	0.0	0.1	20.8	0.1	0.1	0.0	0.0	0.0	0.2	
Cars, PU, Vans	318	339	0	0	0	657	1	496	30	0	4	527	16	0	293	0	2	309	1	1	0	0	0	2	1495
% Cars, PU, Vans	99.1	99.7	0.0	0.0	0.0	99.4	100.0	98.6	100.0	0.0	0.0	98.7	100.0	0.0	99.3	0.0	0.0	99.4	50.0	100.0	0.0	0.0	0.0	66.7	99.1
Heavy Trucks	3	1	0	0	0	4	0	7	0	0	0	7	0	0	2	0	2	2	1	0	0	0	0	1	14
% Heavy Trucks	0.9	0.3	0.0	0.0	0.0	0.6	0.0	1.4	0.0	0.0	0.0	1.3	0.0	0.0	0.7	0.0	0.6	50.0	0.0	0.0	0.0	0.0	33.3	0.9	

Project ID: 20-190014-004
 Location: Brooklawn St & Kroger Truck Ent Southern Dwy/PI
 City: Knoxville

PEAK HOURS

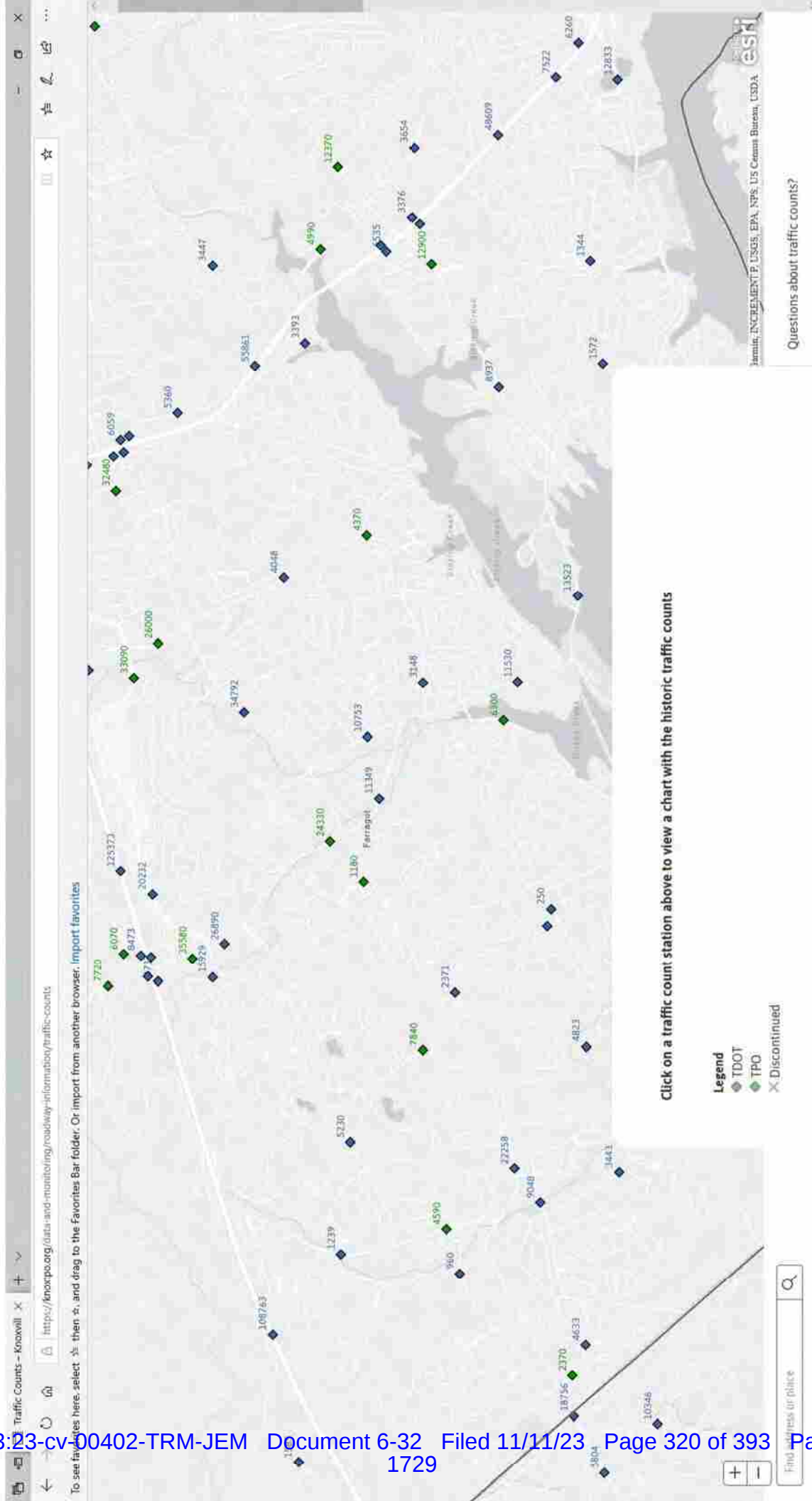
Day: Tuesday
 Date: 10/06/2020

AM

Start Time	Brooklawn St Northbound						Brooklawn St Southbound						Truck Ent Southern Dwy/Pinnacle Access Eastbound						Truck Ent Southern Dwy/Pinnacle Access Westbound						Int. Total
	Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		
7:45 AM	11	20	0	0	31		0	8	0	0	8		0	0	3	0	3		0	0	0	0	0	0	42
8:00 AM	17	23	0	0	40		0	17	2	0	19		0	0	10	0	10		0	0	0	0	0	0	69
8:15 AM	11	18	0	0	29		0	15	0	0	15		0	0	8	0	8		0	0	0	0	0	0	52
8:30 AM	12	9	0	0	21		0	13	1	0	14		0	0	8	0	8		0	0	0	0	0	0	43
Total Volume	51	70	0	0	121		0	53	3	0	56		0	0	29	0	29		0	0	0	0	0	0	206
% App. Total	42.1	57.9	0.0	0.0	100.0		0.0	94.6	5.4	0.0	100.0		0.0	0.0	100.0	0.0	100.0		0.0	0.0	0.0	0.0	0.0	0.0	
PHF					0.756						0.737						0.725								0.746
Cars, PU, Vans	51	70	0	0	121		0	53	3	0	56		0	0	29	0	29		0	0	0	0	0	0	206
% Cars, PU, Vans	100.0	100.0	0.0	0.0	100.0		0.0	100.0	100.0	0.0	100.0		0.0	0.0	100.0	0.0	100.0		0.0	0.0	0.0	0.0	0.0	0.0	100.0
Heavy Trucks	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0	0	0
% Heavy Trucks	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0

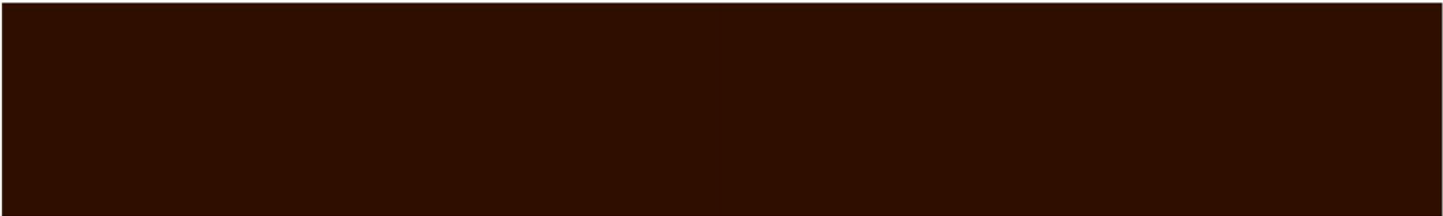
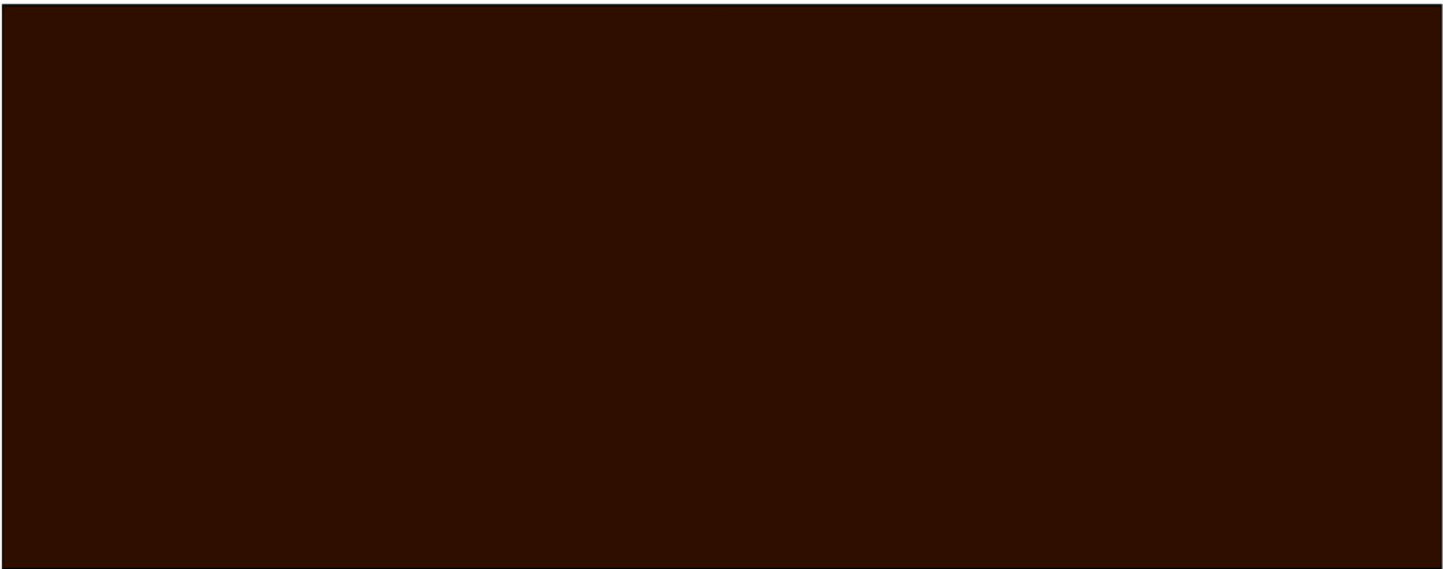
PM

Start Time	Brooklawn St Northbound						Brooklawn St Southbound						Truck Ent Southern Dwy/Pinnacle Access Eastbound						Truck Ent Southern Dwy/Pinnacle Access Westbound						Int. Total
	Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		Left	Thru	Rgt	Uturn	App. Total		
3:00 PM	18	20	0	0	38		0	26	3	0	29		0	0	21	0	21		2	0	0	0	2		90
3:15 PM	23	41	0	0	64		0	29	2	0	31		1	0	20	0	21		0	0	0	0	0		116
3:30 PM	20	26	0	0	46		0	61	2	0	63		3	0	14	0	17		0	0	0	0	0		126
3:45 PM	18	15	0	0	33		0	59	1	0	60		0	0	16	0	16		0	0	0	0	0		109
Total Volume	79	102	0	0	181		0	175	8	0	183		4	0	71	0	75		2	0	0	0	2		441
% App. Total	43.6	56.4	0.0	0.0	100.0		0.0	95.6	4.4	0.0	100.0		5.3	0.0	94.7	0.0	100.0		100.0	0.0	0.0	0.0	100.0		
PHF					0.707						0.726						0.893						0.250		0.875
Cars, PU, Vans	78	101	0	0	179		0	168	3	0	176		4	0	71	0	75		1	0	0	0	1		431
% Cars, PU, Vans	98.7	99.0	0.0	0.0	98.9		0.0	96.0	100.0	0.0	98.2		100.0	0.0	100.0	0.0	100.0		50.0	0.0	0.0	0.0	50.0		97.7
Heavy Trucks	1	1	0	0	2		0	7	0	0	7		0	0	0	0	0		1	0	0	0	1		10
% Heavy Trucks	1.3	1.0	0.0	0.0	1.1		0.0	4.0	0.0	0.0	3.8		0.0	0.0	0.0	0.0	0.0		50.0	0.0	0.0	0.0	50.0		2.3



Maple, INCREMENT P, USGS, EPA, NPS, US Census Bureau, USDA

Questions about traffic counts?





November 2, 2020

Mr. Darryl W. Smith, P.E.
Town Engineer
Town of Farragut
11408 Municipal Center Drive
Farragut, Tennessee 37934

**RE: Traffic Impact Study Report Review
Farragut Town Center at Biddle Farms
Farragut, TN**

Dear Mr. Smith:

Cannon & Cannon, Inc. (CCI) appreciates the opportunity to review the traffic impact study report for the proposed Farragut Town Center at Biddle Farms development prepared by CDM Smith. It is our understanding that the proposed development will consist of a grocery store, retail shops, and multi-family residential units. We further understand that the development will be located east of the existing Kroger development. Access to Kingston Pike and Campbell Station Road will be provided via Brooklawn Street, and the development will also have access to Concord Road. The development is expected to produce between 6,000 and 7,000 new daily trips.

We have reviewed the report for this traffic impact study, and it is our opinion that the overall report content, conclusions, and recommendations were developed using sound engineering methods and assumptions. The utilization of 2016 counts due to current traffic conditions with Covid was appropriate. The annual growth rates of 2.5% for 2020 existing traffic and 3.5% for 2025 background traffic are reasonable as is the factoring of the count at Brooklawn and the driveway accesses by 10%. CDM Smith acknowledged the traffic issues at the intersections of Kingston Pike with Campbell Station Road and Kingston Pike with Concord Road, and they provided potential mitigation measures for these issues.

Regarding traffic generated by the proposed development, we have no issues with the methods utilized and the assumptions made for the trip generation estimates. We further agree that it was appropriate to provide separate trip distributions for the residential and commercial components. Based on the capacity analysis comparisons of background traffic without the development and projected traffic with the development, we agree that the two critical intersections (Kingston at Campbell Station and Kingston at Concord) may experience unstable conditions without mitigation, but that these conditions will not significantly worsen due to traffic generated by the proposed development.

Sincerely,

Brian J. Haas, P.E., PTOE
Project Manager

TEL **865.670.8555**
CANNON-CANNON.COM

KNOXVILLE 8570 Kingston Pike
Knoxville, TN 37921
FAX 865.670.8800

FARRAGUT TOWN CENTER

at Biddle Farms



6312 Kingston Pike, Suite C
Knoxville, TN 37919 (865)588-5171

PCD Rezoning and Land Use Map Amendment Package
November 2020

Table of Contents

- 1) PCD Objectives
- 2) Rezoning Exhibit
- 3) Survey Exhibits
- 4) Conceptual Site Plan (Approved by the Town of Farragut on 07-16-2020)
- 5) Conceptual Grading Plan
- 6) Conceptual Utility Plan
- 7) Conceptual Landscape Plans
- 8) Conceptual Tree Preservation & Env. Sensitive Area Maps
- 9) Site Lighting Elements and Preliminary Photometric plan
- 10) Public Gathering, Hardscape, and Paving Elements
- 11) Architectural Design Statement
- 12) Architectural Design Elements
- 13) Architectural Elevations and Multi-Family Unit Footprints
- 14) Conceptual Iconic Element at Entrance
- 15) Conceptual Signage Vision and Location Plan
- 16) Common Space and Pedestrian Access Exhibit
- 17) Town Right of Way Dedication Exhibit & Cross Sections
- 18) Hydrology Study Summary and Recommendations
- 19) Traffic Study Summary and Recommendations
- 20) Construction Schedule and Phasing Exhibits

The materials presented in this package outline the conceptual design intent for the project as of November 2020, and will be further developed in the design phase of the project.



PCD PLANNING OBJECTIVES

Introduction:

The concept site plan is the product of the merger of:

- The Town of Farragut's desire and vision to create a "downtown" for the community in which a village scale could be complimented with a mixed-use blend of commercial, office, residential, and public place components; with
- Private development goals of advancing high quality and distinctive retail/commercial and multi-family residential for the community of Farragut.

into a single master planned development on the site known as Biddle Farms.

The existing site is occupied by a tired retail strip, a collection of independent out parcels, an extensive flood plain, storm water retention for the Kroger retail development west of the site, and a natural all-season creek that flows north to south through the long axis of the site.

This fusion of public and private objectives is guided by a vision document and design guidelines created by the Town of Farragut. Those guidelines seek a development pattern that promotes a pedestrian friendly setting where outdoor browsing and dining, special events, and street activities can animate the

Site Evaluation:

The site possesses challenges and opportunities. Key elements of which are, the flood plain and the creek, that both govern net site usability. Out parcels separately owned must be honored within the overall property boundary and access for their continued use protected.

The existing retail complex is seen as outdated and is not considered worthy of protection.

Much of the site was built in compliance with FEMA regulations and marginally meet the federal guidelines that standard imposes. Farragut imposes a greater standard which negatively affects all the existing structures and infrastructure.

As part of a master planning effort, the hydrology of the area must be evaluated and the storm water management governing retention, storage, outflow, and water quality must be applied to moderate flooding that occasions the site and improve impacts on neighboring sites downstream from the subject parcel.

The development vision, while it considers the entirety of the Biddle Farm, will focus on a select portion of the site assigned to the development vision. This section will largely overlay the existing impervious surfaces

development in a 24/7 setting, and where residents within the Town Center can enjoy the "downtown" as an added quality of life amenity.

By contrast to the pedestrian experience, parking lots are directed to be largely shielded from public view along the internal street. Street parking by exception using angled or parallel spaces along internal and some external streets are intended to serve as both calm traffic and convenient access to commercial venues.

The primary frontage on Kingston Pike seeks a "main street" intersection aligned with the existing signal in serving the high school to the north. Brooklawn Street shall define the westerly border, Concord Road the easterly border, and Campbell Station Road the southern border.

Within limits of environmental restrictions all four street shall seek interconnectivity through the site so to allow both vehicular and pedestrian movement to access the "town center" from any direction and discharge accordingly.

A limited number of older structures that were part of the Biddle farm may be viewed as of historic value and were to be considered in the planning. of the prior retail occupancies and extend southerly along Brooklawn Street. Much of the remaining lands will be held in reserve for "open space" and storm water detention. This open space could prove of value as a public place suitable for informal events, open air activities, and leisure enjoyment.

The creek with its wooded shoulders, offers an ideal opportunity to have a lineal park reaching through the site offering pedestrian, bicycle, and accessible movement as a natural outdoor promenade for area residents to enjoy.

An existing retention pond in service to Kroger should be consolidated into a master storm water management system allowing for a more compact allocation of lands to complete the Town Center composition.

A roundabout on Brooklawn Street offers some traffic calming along that "cut through" drive. The integration of residential occupancy in any mixed-use setting should seek roads with moderated speeds and traffic lanes that encourage more cautious movement.

FARRAGUT TOWN CENTER

at Biddle Farms

A Special Observation:

Within the time of the master planning and staff coordination of the proposed development the impact of the Corona Virus emerged and forever has changed much of the lifestyle and value system all seek to enjoy. The impact of this crisis may stay with all of us for a long time, impacting the ideals of group gatherings, and social activities for the foreseeable future. Planning has and will continue to seek an optimistic view that a measure of the "old normal" will return, where sidewalk dining, and events of community interest (art festivals, car shows, community concerts, etc.) will again be allowed and invited. The plan however also seeks to consider the necessary dependency upon retail and service access without leaving the car. This standard has now become a public health consideration. Measures to address this "new normal" should also consider the best way to protect the pedestrian experience while not imposing hardships on either consumers or the service/store entities that cater to their needs.

The Design Response:

Through the design process virtual images were generated to offer texture to the two-dimensional planning proposals as they unfolded. These images sought to offer assurances on scale, pedestrian comfort, landscape applications that deviate from rigid interpretation of the design guidelines, parking, signage, and exterior character and finish. Great care was taken in seeking proportions sufficient for comfort but not too expansive they "institutionalize" the streetscape or setting.

The integration of residential occupancies into a unified campus offers challenges and benefits. While retail is an amenity when convenient enough to walk to it, it can be an intrusive neighbor when noise, trash and service demands are considered.

Vertical mixed use was thus strongly resisted in favor of a horizontal plan where commercial users, and their vehicles would not overlap the private and more sanctified accommodations of the residents who would choose to line in the Town Center. Pedestrian connectivity is promoted with a "village square" that both commercial and residential share. Pedestrian promenades down "main street" and around the square connect access from all four street edges and insure by treatment the internal street system appears like a pedestrian area you can drive through rather than a vehicular area you can walk by.

Objectionable views of service areas are managed to a minimum. Residential buildings facing the public streets of the development shield exposure to the parking fields of the residents and offer residents a secure parking domain free of non-residential demand.

Brooklawn Street is changed from a three-way street with suicide center lane, to a two-lane street with diagonal parking. This softens the street face for residences, calms through traffic, and offers more landscaping opportunity than with just a planted parkway between sidewalk and curb.

The commercial portions of the complex seek a one- and two-story statured heights allowing for store ceilings as high as 18 to 20 feet within. False second floor facades animate the street elevations and offer both material and height variations that create an appearance of independent structures attached instead of the more typical retail ribbon façade in most shopping districts.

The residential structures seeking compact adjacency to the commercial are proposed at four stories with 9 and 10' ceiling heights. While taller their vertical proportions will not oversize that of the neighboring commercial structures. Dwellings will address the street with private porch like entries and with raised stoops and porches reflective of traditional designs.

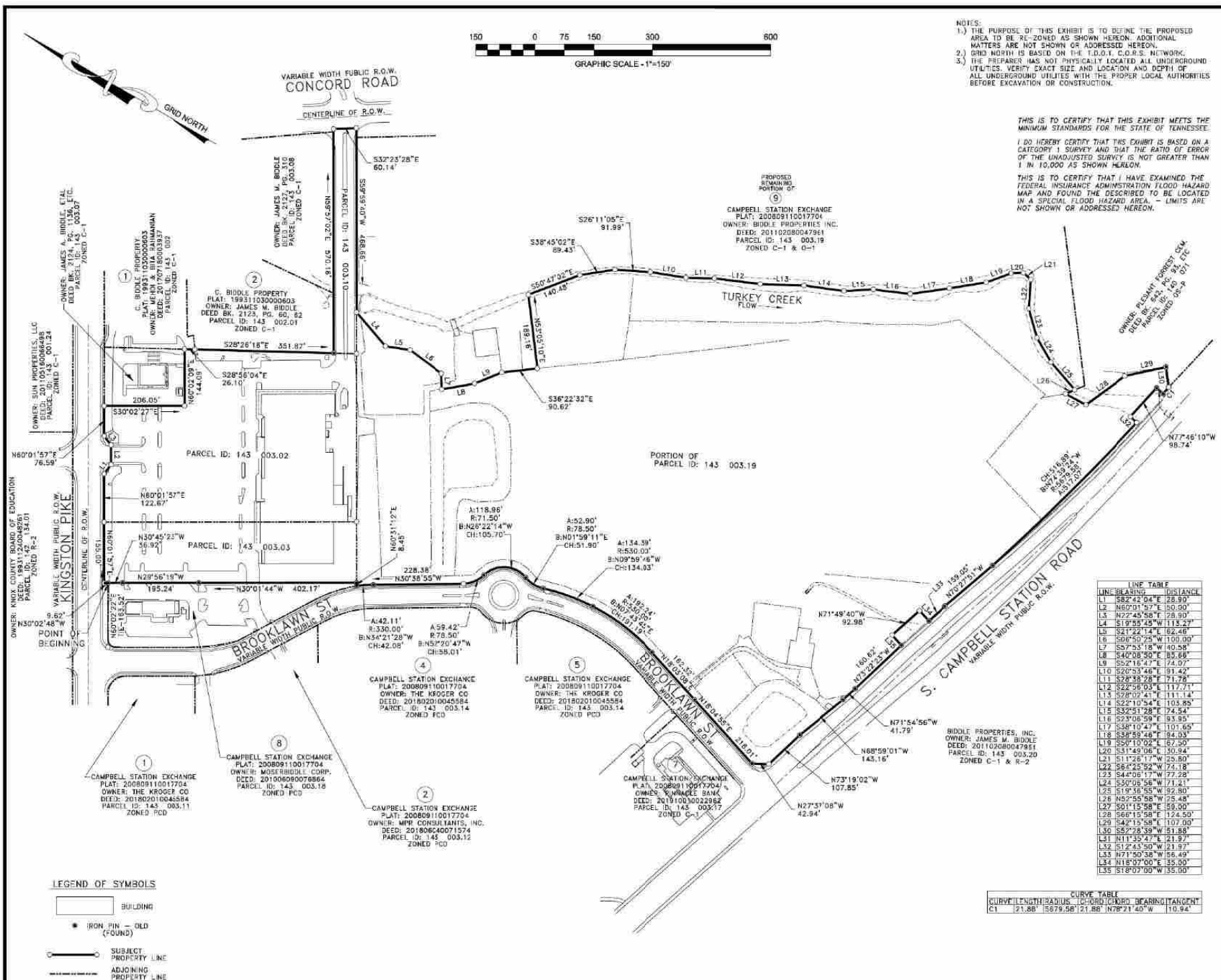
The overall appearance borrows from traditional proportions and materials while seeking a current appeal reflecting the taste and expectations of a New Town Center.

Summary:

The plan, the street images, the narrative are offerings that are intended to show objective. More work is needed to carry the vision instruments to fulfillment. Engineering, environmental, and regulatory standards will guide the next evolution of the Town Center. Some flexibility toward full compliance with all regulatory and constructability standards will be necessary. This plan intends to subscribe the goals it portrays even if changes are essentially demanded.

A community vision paints a picture that does not consider economic reason. A private development requires economic balance between vision and performance. Much of the images shown are untested in the market. The development team recognizes the risk associated with unproven solutions and accepts this risk depending upon the collaborative understanding from the Town of Farragut in the efforts that have preceded this submittal. Staff and applicant agree with balance both missions can be fulfilled.

It is the hope of the development team this submittal would be found sound and representative of both the community vision and the development opportunity, each of which need to succeed before future physical implementation can begin.



EXHIBIT

Proposed Re-Zoning Exhibit

Area To Be Re-Zoned

Kingston Pk., Campbell Station Rd., Brooklawn St., & Concord Rd.
Civil District No. 6 of Knox County, Tennessee
Town of Farragut

REVISIONS

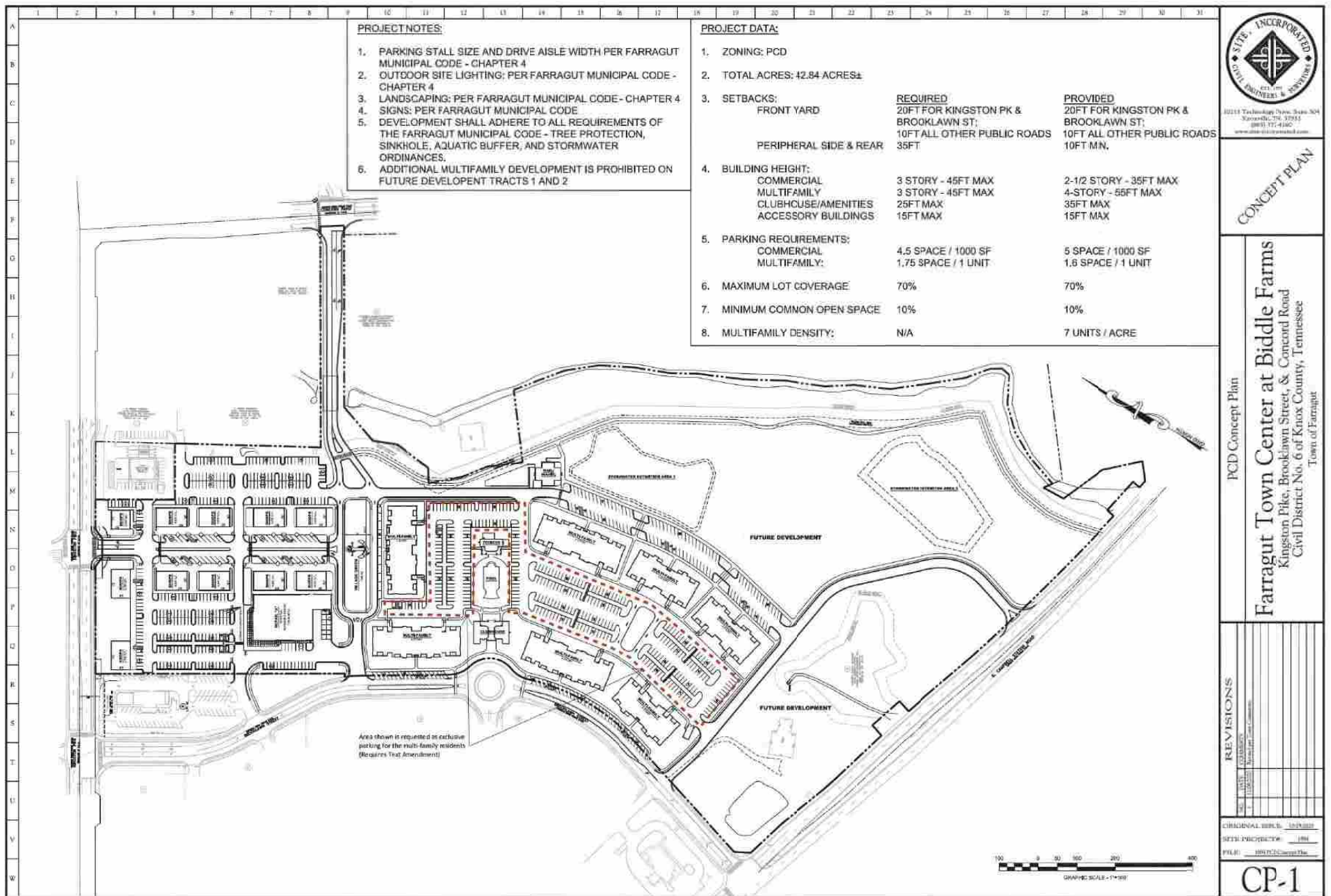
NO.	DATE	COMMENTS
1	11/09/2020	REVISION FOR TOP COMMENTS

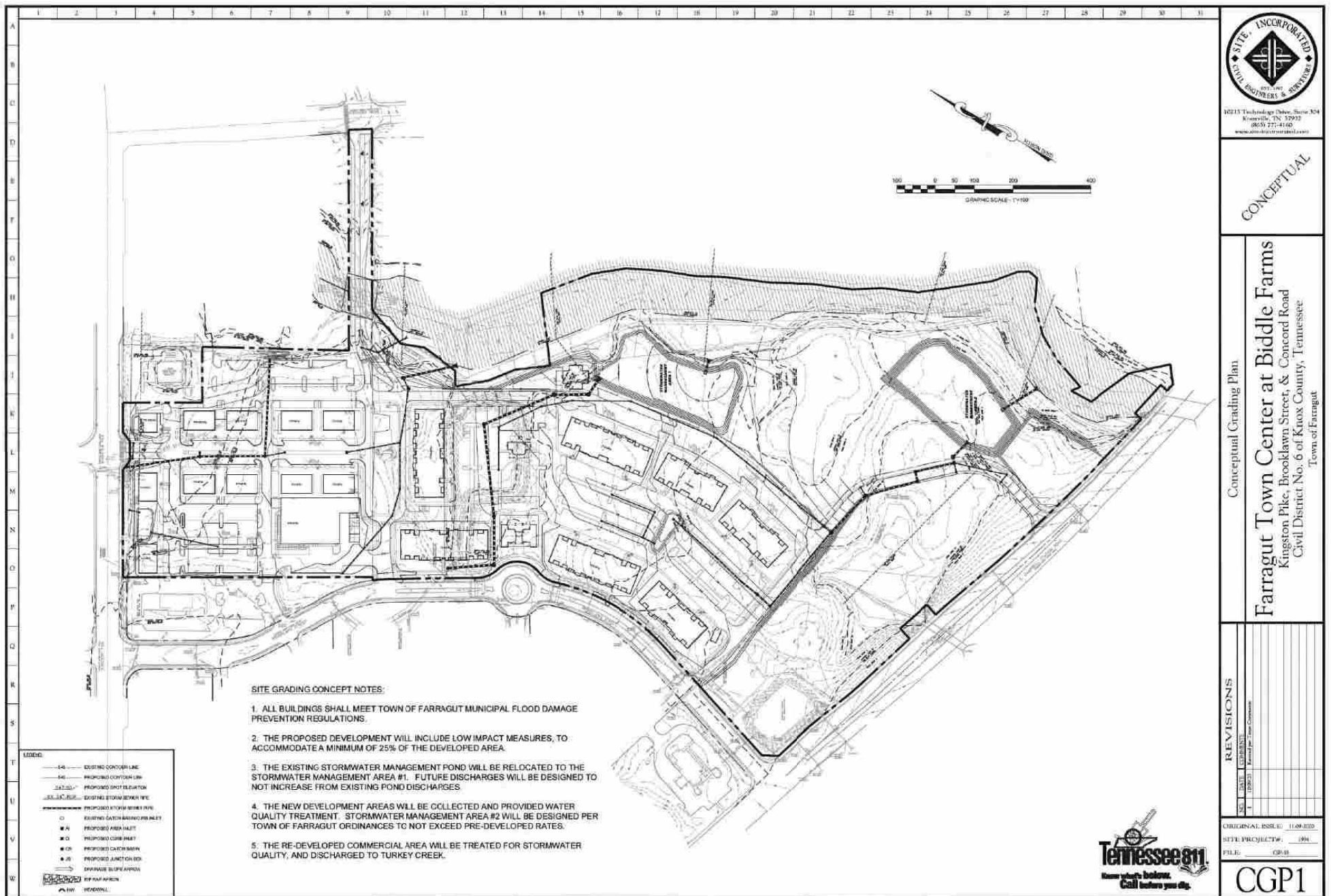
ORIGINAL ISSUE: 09/11/2020

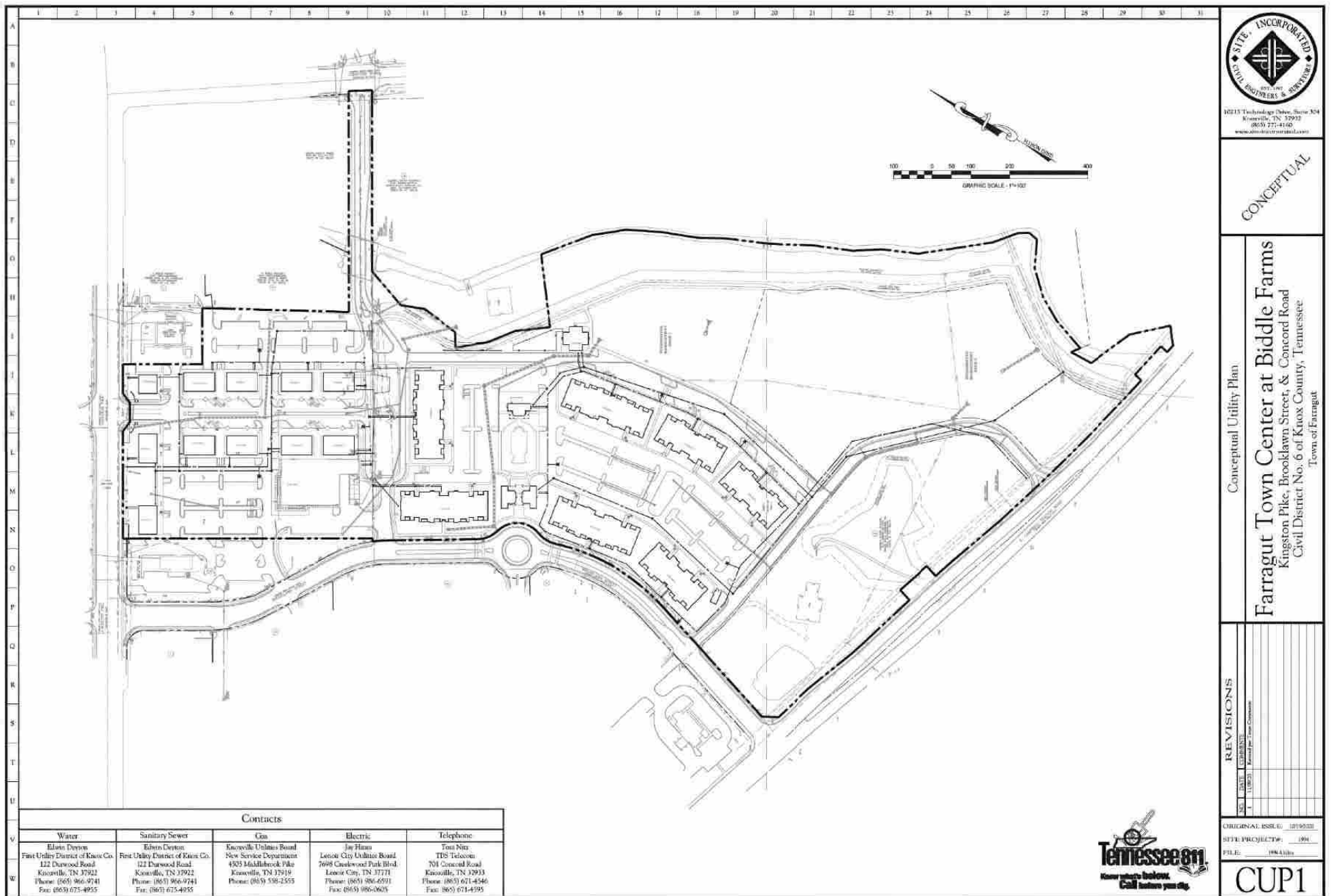
SITE PROJECT#: 1994

FILE: 190076R2

RZ1.0







CONCEPTUAL

Conceptual Utility Plan
Farragut Town Center at Biddle Farms
 Kingston Pike, Brooklawn Street, & Concord Road
 Civil District No. 6 of Knox County, Tennessee
 Town of Farragut

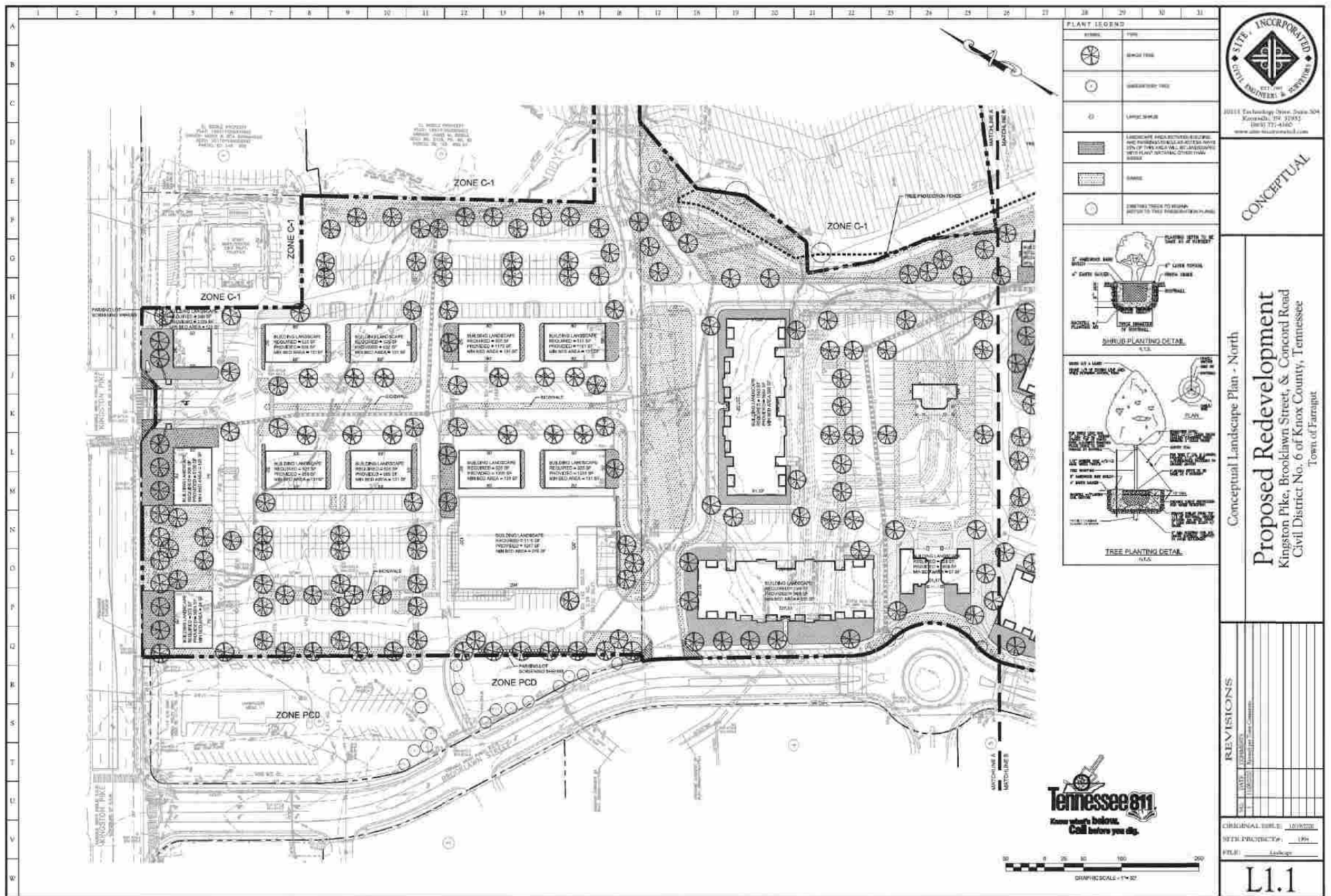
REVISIONS		
NO.	DATE	DESCRIPTION
1	11/10/23	Revised per Town Comments

ORIGINAL ISSUE: 10/19/2023
 SITE PROJECT#: 1994

FILE: 1994.dwg



Contacts				
Water	Sanitary Sewer	Gas	Electric	Telephone
Elwin Dorton Fair Utility District of Knox Co. 112 Dunwood Road Knoxville, TN 37922 Phone: (865) 966-9741 Fax: (865) 675-4955	Edwin Dorton First Utility District of Knox Co. 112 Dunwood Road Knoxville, TN 37922 Phone: (865) 966-9741 Fax: (865) 675-4955	Knoxville Utilities Board New Service Department 4825 Midlandbrook Pike Knoxville, TN 37919 Phone: (865) 538-2555	Jay Hana Lecost City Utilities Board 7699 Greelwood Park Blvd. Lenoir City, TN 37771 Phone: (865) 986-6591 Fax: (865) 986-0635	Tom Nitz TDS Telecom 701 Concord Road Knoxville, TN 37933 Phone: (865) 671-4546 Fax: (865) 671-4795





FARRAGUT TOWN CENTER at Biddle Farms

Site Lighting Elements

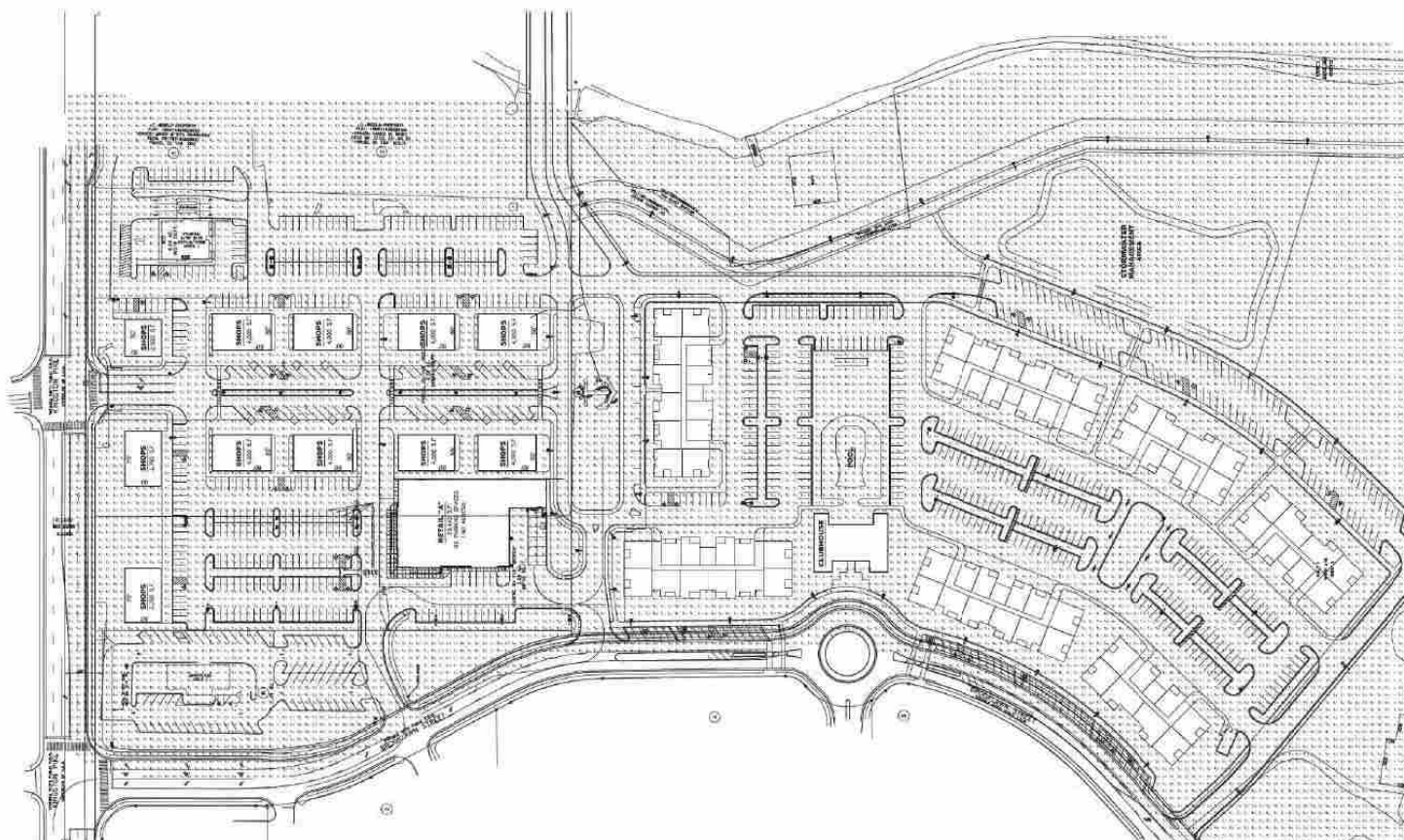
The overall objective of the site lighting for the proposed project is to develop a safe, warm, and inviting center where hours of use and operation extend past normal daylight hours. The site is divided into the areas of in response to the different site lighting needs that can be found throughout the site.

All lighting for the proposed project will meet the Town's outdoor lighting requirements and the lighting requirements specific to the Mixed-Use Town Center land use.

- Main parking fields will include 28' tall, tapered metal poles with rectangular, flat lens, LED fixtures with either one, two, or three heads per pole. Higher poles in the parking fields allow the use of fewer strategically placed poles to avoid conflicts with landscaping and parking while providing more uniform light levels.
- Streets adjacent to parking or proposed buildings may utilize the same fixture and pole type as the main parking fields, but the pole height will be reduced to 18' to 20' in these areas to reduce the visual impact on adjoining streets.
- Public street and common space area lighting will be provided utilizing decorative pole types and fixtures as shown on the site images previously provided for the project. Fixture types will be LED, and poles will be in the 16' to 18' range in height.
- Pedestrian area lighting will be provided with a mixture of building wall mounted and decorative pole mounted lights. A diverse group of fixtures will be utilized for pedestrian area lighting to add energy and character to the center. Fixtures will be LED and mounted between 10' and 16' range in height.
- Service Areas not illuminated by poles will be illuminated by wall mounted rectangular fixtures similar in appearance to the lights in the main parking fields. Fixtures will be LED and mounted at approximately 16' in height.



REVISIONS		
REV #	DATE	BY:



BASED ON THE INFORMATION PROVIDED, ALL DIMENSIONS AND LUMINAIRE LOCATIONS SHOWN REPRESENT RECOMMENDED POSITIONS. THE ENGINEER AND/OR ARCHITECT MUST DETERMINE APPLICABILITY OF THE LAYOUT TO EXISTING OR FUTURE FIELD CONDITIONS.

THIS LIGHTING PATTERN REPRESENTS ILLUMINATION LEVELS CALCULATED FROM LABORATORY DATA TAKEN UNDER CONTROLLED CONDITIONS UTILIZING CURRENT INDUSTRY STANDARD LAMP RATINGS IN ACCORDANCE WITH ILLUMINATING ENGINEERING SOCIETY APPROVED METHODS. ACTUAL PERFORMANCE OF ANY MANUFACTURER'S LUMINAIRE MAY VARY DUE TO VARIATION IN ELECTRICAL VOLTAGE, TOLERANCE IN LAMPS AND OTHER VARIABLE FIELD CONDITIONS.

RECOMMENDED LUMINAIRE							
Location	Qty	Size	Watt	Beam	Foot Candles	Foot Candles	Foot Candles
WALKWAY	10	100	100	100	100	100	100
WALKWAY	10	100	100	100	100	100	100
WALKWAY	10	100	100	100	100	100	100
WALKWAY	10	100	100	100	100	100	100
WALKWAY	10	100	100	100	100	100	100
WALKWAY	10	100	100	100	100	100	100
WALKWAY	10	100	100	100	100	100	100
WALKWAY	10	100	100	100	100	100	100
WALKWAY	10	100	100	100	100	100	100
WALKWAY	10	100	100	100	100	100	100

LUMINAIRE SCHEDULE							
Qty	Size	Watt	Beam	Foot Candles	Foot Candles	Foot Candles	Foot Candles
10	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100

FARRAGUT TOWNE CENTER @
BIDDLE FARMS
FARRAGUT, TN

WLS LIGHTING
a WLS company

1919 WINDSOR PLACE
FORT WORTH, TX 76110
WWW.WLSLIGHTING.COM

WLS-13526 DATE: 10/13/20 SCALE: 1"=50'

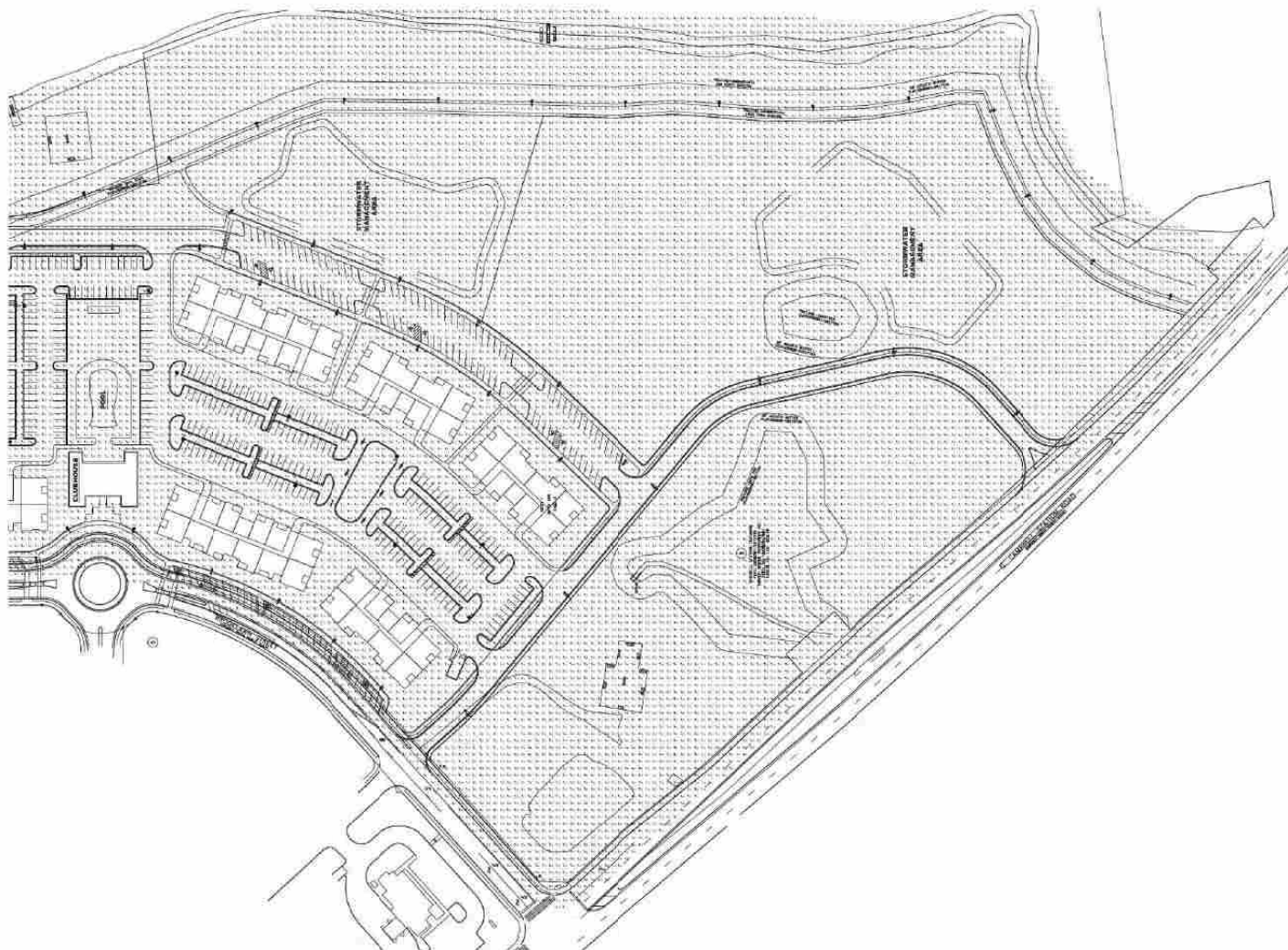
800-633-8711

PM: HOLLY

BY: J.P.

SHEET 1 OF 2

REVISIONS		
REV #	DATE	BY:



BASED ON THE INFORMATION PROVIDED, ALL DIMENSIONS AND LUMINAIRE LOCATIONS SHOWN REPRESENT RECOMMENDED POSITIONS. THE ENGINEER AND/OR ARCHITECT MUST DETERMINE APPLICABILITY OF THE LAYOUT TO EXISTING OR FUTURE FIELD CONDITIONS.

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LUMINAIRE SCHEDULE									
LUMINAIRE	QTY	WATT	FOOT COUNTS	SPACING	WATTAGE	FOOT COUNTS	SPACING	WATTAGE	FOOT COUNTS
1.0000000000	10	100	1000	100	1000	1000	100	1000	1000
2.0000000000	10	100	1000	100	1000	1000	100	1000	1000
3.0000000000	10	100	1000	100	1000	1000	100	1000	1000
4.0000000000	10	100	1000	100	1000	1000	100	1000	1000
5.0000000000	10	100	1000	100	1000	1000	100	1000	1000
6.0000000000	10	100	1000	100	1000	1000	100	1000	1000
7.0000000000	10	100	1000	100	1000	1000	100	1000	1000
8.0000000000	10	100	1000	100	1000	1000	100	1000	1000
9.0000000000	10	100	1000	100	1000	1000	100	1000	1000
10.0000000000	10	100	1000	100	1000	1000	100	1000	1000

LUMINAIRE SCHEDULE									
LUMINAIRE	QTY	WATT	FOOT COUNTS	SPACING	WATTAGE	FOOT COUNTS	SPACING	WATTAGE	FOOT COUNTS
1.0000000000	10	100	1000	100	1000	1000	100	1000	1000
2.0000000000	10	100	1000	100	1000	1000	100	1000	1000
3.0000000000	10	100	1000	100	1000	1000	100	1000	1000
4.0000000000	10	100	1000	100	1000	1000	100	1000	1000
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7.0000000000	10	100	1000	100	1000	1000	100	1000	1000
8.0000000000	10	100	1000	100	1000	1000	100	1000	1000
9.0000000000	10	100	1000	100	1000	1000	100	1000	1000
10.0000000000	10	100	1000	100	1000	1000	100	1000	1000

FARRAGUT TOWNE CENTER @
BIDDLE FARMS
FARRAGUT, TN

WLS LIGHTING
a WLS company

1919 WINDSOR PLACE
FORT WORTH, TX 76110
WWW.WLSLIGHTING.COM

WLS-13526 DATE: 10/13/20 SCALE: 1"=50'

800-633-8711

PM: HOLLY

BY: J.P.

SHEET 2 OF 2

Public Gathering Spaces, Hardscape, and Paving Elements

One of the most important objectives of the proposed Town Center design is to incorporate vibrant and inviting public gathering spaces that seamlessly connect the retail and multi-family portions of the project and provide the citizens of the Town of Farragut with gathering space for public events that take advantage of the available amenities that the project offers. The seamless connection is achieved through the following elements:

- The removal of walking barriers by treating the streets without vertical curbs such that the entirety of the expanse is near level and fluid when entirely assigned to pedestrian access.
- The treatment of the driving surfaces in the village center with pavers to promote the impression of a walking surface you could drive on rather than a driving surface you could walk on.
- Pressing landscape to the edges to frame the village square instead of populating this public place bringing sidewalks closer to the building faces to isolate a central area within that pedestrian boundary that could be outdoor “flex space”.

Additionally, hardscape design is a natural extension of the storefront and provides connectivity between different buildings, parking areas and pedestrian paths. Diverse scoring patterns, colored concrete, and stamping enrich the sidewalk and enhance the sense of place. Combined with landscape areas, tree wells, benches, planters, pedestrian level lighting and other site amenities, a well-designed hardscape encourages a more relaxed and friendly Town Center experience.



Architectural Design Statement

The overall objective of the Development Team has been to create an inviting mixed use community that blends commercial and residential occupancies into a walkable environment that emulates the key principles of Traditional Neighborhood Planning and Design while honoring the image and identity of the Town of Farragut as advanced in their development guidelines.

To affect this outcome the land planning effort and architectural imaging sought to promote the following key distinctions that comprise Traditional Neighborhood Design while offering an expression of style and finish consistent with the qualities that hallmark Farragut.:

- Create a Town Center that offers a site arrangement that capitalizes on the natural assets within the site, the access arrangements currently serving the site, and the existing commercial and historic occupancies of the site to be preserved.
- Seek an expanded focus on pedestrian friendly design and pedestrian interconnectivity with all buildings within the town center, both residential and commercial, able to move seamlessly on a network of walkways, trails and promenades interfacing with priority over the vehicular demands generated by the service activities and public events that will coexist within the development.
- Place buildings to the street to create intimate relationships with the public way between indoor and outdoor environments.
- To the extent possible, shield from the public way from large or expansive parking areas such that the street experience features finished and landscaped fades that create a pedestrian environment with priority over the vehicular environment.
- Fashion a street scape that invites leisure activities such as outdoor display, dining, and occasional event venues that celebrate community through healthy interaction by both business and residential constituents.
- Express the structures with a modeling of massing, material and detail that avoids long straight walls and unarticulated facades while concurrently promoting expanded "eyes on the street" (windows viewing the public way) to enhance a sense of interest, personal scale and a measure of perceived public safety.
- Use rich materials consistent with quality expressions of architecture, and workmanship associated with durable performance.
- Landscape with a view to maturity with trees and shrubbery that improve the overall quality of appearance and outdoor comfort over time.
- Visually manage service areas and infrastructure to minimize negative impact on neighboring uses

- Screen rooftop mounted equipment utilizing building elements to shield from public view.
- Develop well-engineered responses to storm water management, flood plain capacities, and environmental features worthy of protection and enrichment.
- Create a "living place" that attracts residents and merchants seeking a synergistic environment that offers 24/7 occupancy.
- Promote opportunities through design and site arrangement for managed and spontaneous public events through the creation of a "sense of space" within the town center, along its public river walk, and at outdoor open space suitable for unstructured park-like relaxation.

It is the hope both the plan and the character studies advanced provide both inspiration and responsive direction to the future of the Town of Farragut.



FARRAGUT TOWN CENTER at Biddle Farms

Architectural Elements

Central to the creation of a walkable mixed-use setting are features of *scale, safety, convenience, and character*. Each of these important standards has been used to advance concepts to the stage they are offered today.

The traditional site design standards guiding the current town center plan offer direction, but the market itself also offers important criteria that will activate their acceptance and maintain their continuing value for a project well-conceived and executed.

Consumer preference is undergoing major changes. The changes are found in everything from housing, work, school entertainment and shopping are hard to ignore. The Virus along with a preexisting trend toward internet dependency on everything we do has impacted what the future resident, business tenant, and surrounding community will expect from such an undertaking.

Please then explore briefly the key elements identified and how they have been incorporated into the planning for this important development:

Scale:

Farragut is a TOWN, and proud of its status as such. It is not an urban settlement. Within "towns" you would expect to find everything proportioned closer to the scale of an individual than that of a larger population. To that end every element of the plan must consider how to moderate the overall size of the concept such that in all areas offer a physical relationship that is comfortable and selectively even intimate. Affording the individual both personal space as well as promoting congregate place are the blended objectives.

This is best accomplished by integrating detail and rhythms that promote the experience of living, working, or shopping even when portions of the overall complex are nearly devoid of others, so as not to feel "overwhelming". Concurrently the scale should allow community gatherings of fellowship to feel secure and personal. The tools in this arsenal reside in the character of the street scape, and the cadence of features that link all parts together.

- The frequency of spacing trees along the public promenades.
- The comforting width of walkways that invite shared use.
- The heights of streetlights adorned with season banners the add day and night value to the street scape.
- The stature of doorways, windows, and canopies offering incremental shade and relief along the main street.
- The invitation to enjoy either the inside or outside parts of a vender's offering.

- The use of appropriately scaled signs directed at the individual rather than the highway.
- The richness of materials employed that show detail and craftsmanship.
- The feature accents of street furniture,
- plus others....

...all combine to establish scale that when occupied offers a warm and comforting reaction and promotes a continuing invitation to explore the range of venues and passages offered for inspection.



FARRAGUT TOWN CENTER at Biddle Farms

Safety:

Scale is a natural companion to “perceived” safety. When coupled with the planning principles of *Crime Prevention Through Environmental Design* (CPTED) the physical place that is created advances the perception of safety to a functional level of improved safety.

- The use of “Eyes on the street” is a phrase often used to promote the frequency of windows facing public and private areas as a form of courteous intimidation to those who would do harm.
- The avoidance of easily accessed blind or obscure service areas that can harbor mischief.
- The use of lighting the softly distributes light instead of introducing glaring light the obscures areas around it.
- The management of shrubs and landscape kept low and arranged to avoid creating hiding areas.
- The organization of the plan in ways that make wayfinding intuitive.
- The structuring of street crossing that declare with feature pavement “the pedestrian has priority”.

...all contribute to the sense of place that feels and functions with personal safety as a priority



Convenience:

Convenience is not measured in distance; it is measured in time! The human reaction to the question of “How far is it from here?” is to respond with a time reference such as, “About 20 minutes away”. Time can be an obstacle unless the experience of time is filled with interest along the way.

The integration of mixed use in a 24/7 setting makes daily activities feel convenient. Even if just walking the dog, the setting allows the effort to engage with views and points of interest that make the activity fulfilling the time index feels less of a compromise.

Convenience can also be a competitor to the mission of a well-ordered environment. Today everything from class work and vocation, to shopping and worship can be done with a click of a button from a comfortable chair at home. This tendency to hibernate is contrary to building community. When the experience of place can activate “mobility” over “time efficiency” and the activities of our daily routine are enriched because they can occur both time efficiently and within a pleasing setting, then the best form of convenience has resulted. When personal mobility becomes an alternate to driving or Ubering, society becomes healthier and more engaged with the place they live, work, and shop and the people they share that place with.

Character:

When considering what makes one place more inviting and interesting than another, the distinction derived from its appearance can often be the measure of difference. More than just the look of structures, it is the full assemblage of all parts of the created environment that create the signature of something special.

Measured uniformness has value in building a cohesive feel to a settlement of many parts and functions.

- The treatment of the walking surfaces,
- The range and appeal of exterior materials,
- The selection of landscape species and their orderly application and maintenance,
- The timeless execution of facades and focal points,
- The invitation of patina as an expression of maturity;

...can all be unifying parts of what individually might be seen as an assortment of separate functions and features.

A theme need not be expressed in a style, **but rather in an experience** that serves the overall objective. The Town Center thus must offer a holistic experience unified with elements of sight, sound, textures and potentially even fragrances, while still allowing variety of expression within that range of consistent quality, that combined keep all the parts feeling as members of a unified family of thought.

FARRAGUT TOWN CENTER

at Biddle Farms

The Application:

The mixed-use nature of the Town Center is evidenced by the fusion of residential and business uses into one cohesive composition. In true town fashion these are not competitive but complementary interests. Both rely on each other to optimize the experience that can only be fashioned with the merger of these important parts.

Scale: The public face of each sector shares a common pattern of materials and forms. Both have been enveloped with brick, siding, and window/door treatments of preferred quality as a testament to durable and traditional flavors.

The exterior faces have been fashioned with varying applications of these materials so to generate a measure of variety without appearing as random or disconnected parts.

The scale of the main street seeks a human scale with statured two-story or appearance thereof facades offering both vertical and horizontal modeling, while avoiding the conventional lineal alignment often found in commercial centers.

The scale of the residential structures, while higher by floor count, is rusticated with bolder forms at the lower levels, slowly stepping back to lighter forms as the building elevation rises to the roof level. The scale is also moderated by the horizontal animation of the plans and the treatment of exterior materials on the façade to emulate attached narrower independent facades, avoiding one monolithic building statement.

Safety: The arrangement of all structures is such that none have a "backside". All buildings are surrounded by publicly exposed facades (*with exception of one small and secured service lane between grocery and other retail elements*). Each façade is companioned by a pedestrian network that abuts parking and invites ready access to front and rear approaches, and selectively to area gardens between structures that connect all sides with walkable interconnectivity.

In the commercial sector, along the main street, parking is brought to the curb for quick access, while in most areas the bulk of the parking field is fragmented into smaller separate zones and held away from the "public street" frontage

The intimate context of the main streets and the public square offer clear oversight from store fronts and residential windows. The larger parking fields offer shielded box lighting to insure nighttime legibility for patrons after dark.

In the residential sector, the buildings compose a collar around an internal parking domain set aside exclusively for residents, awarding them a safe relationship between vehicle and dwelling door. Concurrently the outward face of this collar orients to the public thoroughfares with a public entry duplicating invitation for guest. Here again windows, doors, and walkways surround buildings and advance "eyes of the street" as a prevention to unwanted activity.

Resident parking is lighted similar to the commercial parking fields, while street lighting along the public road perimeter mirrors the scale and treatment of the main streets in the commercial zones.

Convenience: Both the commercial and residential areas merge around the town square, the central hub of all development interaction. From this hub, ready access to home, shopping, park areas, and external routing are easily and quickly affected.

Within the residential sector, residential amenities are centrally located within reach if not line of site from dwellings that surround this lifestyle feature.

The convenience internally is matched by the convenience directed to adjacent features equally important to the Town Center, such as shopping across Brooklawn Blvd, education across Kingston Pike, town government offices to the west, and professional services along the frontages of the external public roads. For many within, an unusually large number of daily destinations are within a few minute walk or bike ride.

Character: Today's market seeks expressions that offer reflections of the past, housed in settings appropriate to current lifestyle and technologies. Achieving both a classical sense of form with traditional materials and applications, while expressing the "NOW" demands of our current wants requires a balance of elements that offer both collective distinction and harmonious interplay.

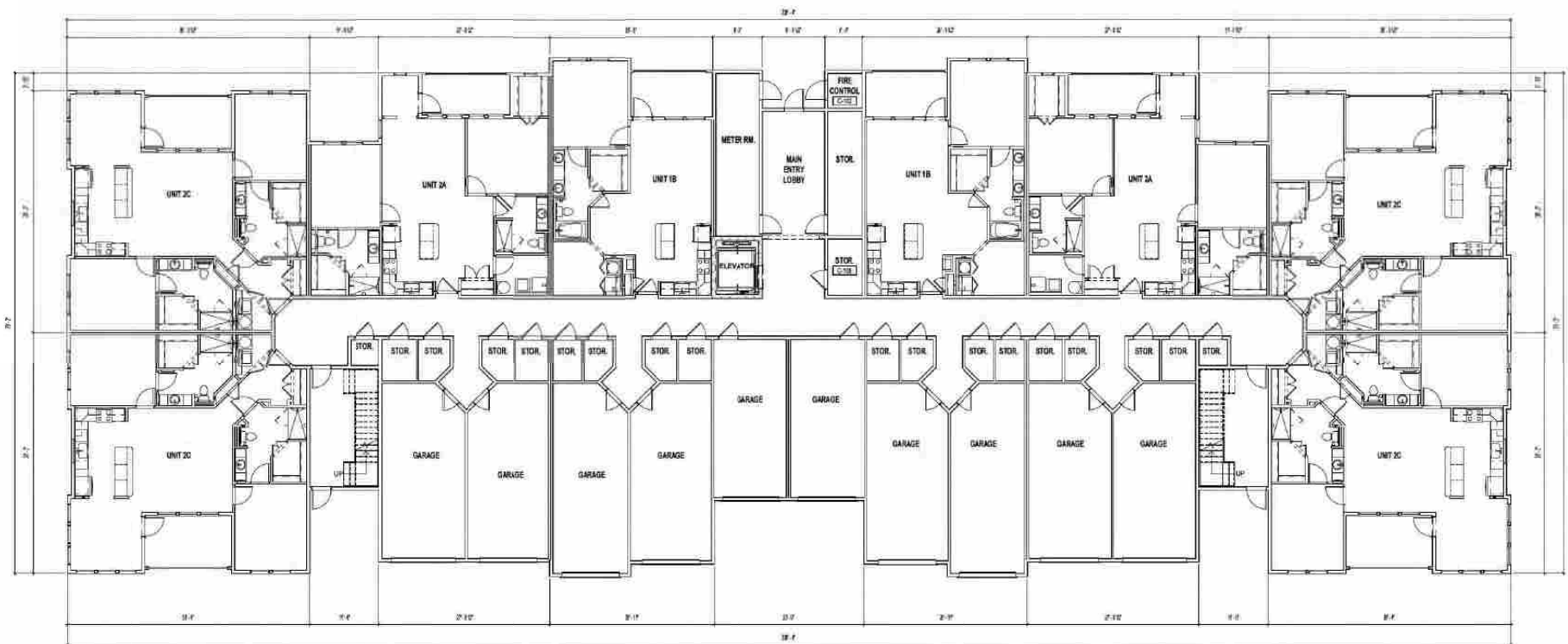
The combination of all the elements that speak to our physical senses; sight, smell, touch, sound, and even taste, are the palate that has guided the design representations. More will come into focus as the design is refined through the continuing advancement of this proposal and through the life of its successful operations.

This proposal seeks to establish a feel and identity that would hallmark Farragut as a representation of its self-image and a center piece of its community's leisure lifestyle.

Summary:

It is unlikely the lessons learned from the Corona virus will ever go away. Magnified home deliveries, quick pick up and Uber/Lift accommodations, de-congested public places, touch free appointments, work at home preference are all here for the long term. Accommodation for this new paradigm must also be considered as many seek the efficiencies in time they afford.

The proposal has evolved since the design process began, in recognition of this changing condition and the permanence it has already vested in the lives of all residents. Continuing lessons remain ahead and the need for flexibility should never be forgotten. **Static pictures are not as vital as moving pictures.** The presentation offers a point of beginning but not the final outcome. That will continuously model as we move together in the future.



H1 BUILDING TYPE A - GROUND LEVEL PLAN
1/8" = 1'-0"



BUILDING TYPE A - GROUND LEVEL PLAN

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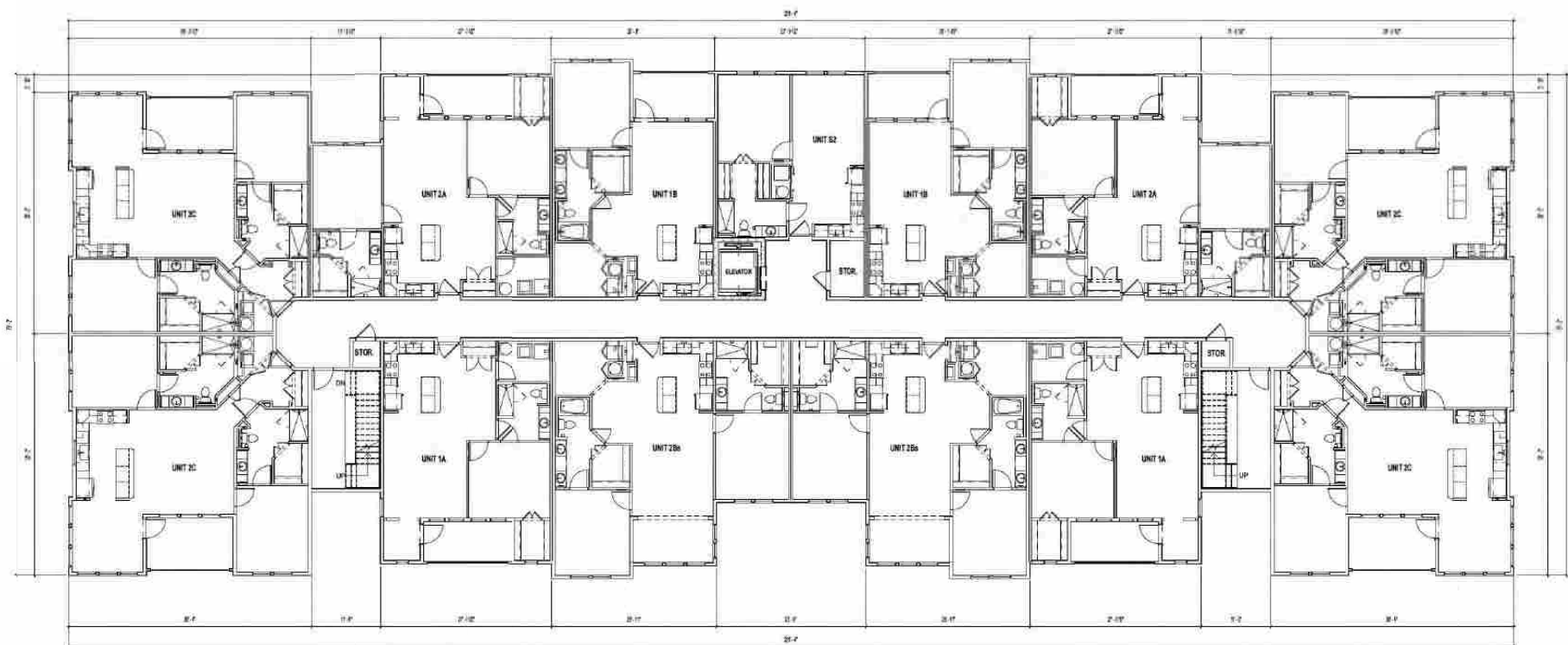
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H1 BLDG. TYPE A - 2ND LEVEL PLAN
1/8" = 1'-0"



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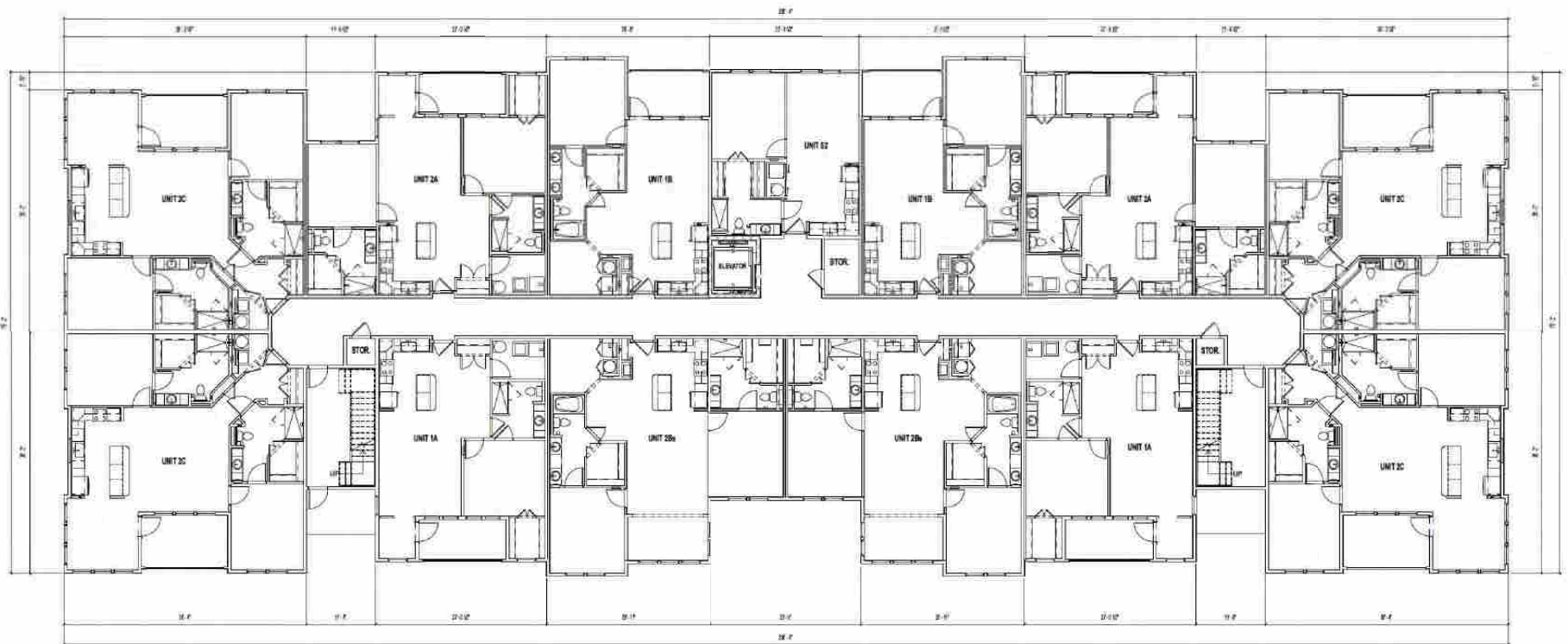
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H1 BLDG. TYPE A - 3RD. LEVEL PLAN
1/8" = 1'-0"



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H1 BLDG. TYPE A - 4TH LEVEL PLAN
1/8" = 1'-0"



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H1 BUILDING TYPE B - GROUND LEVEL PLAN
1/8" = 1'-0"



BUILDING TYPE B - GROUND LEVEL PLAN

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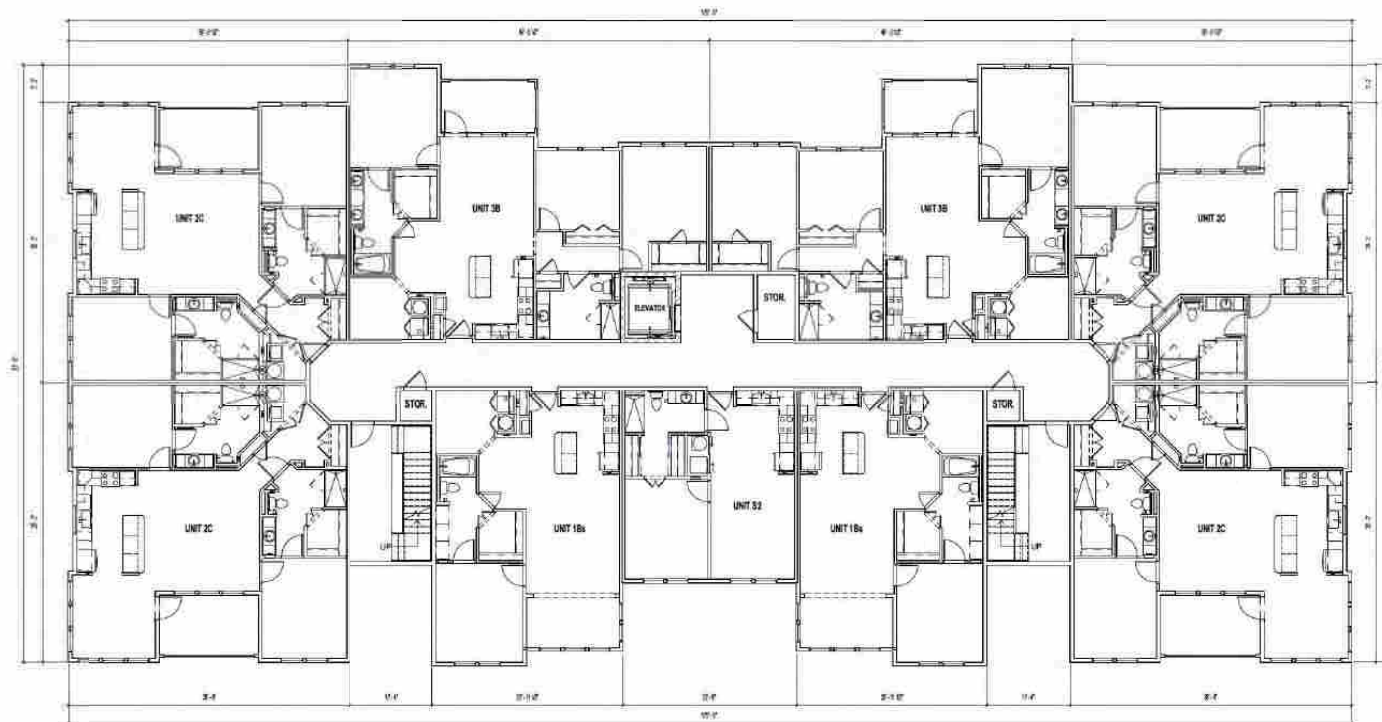
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H1 BLDG. TYPE B - 2ND LEVEL PLAN
1/8" = 1'-0"



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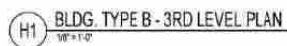
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H1

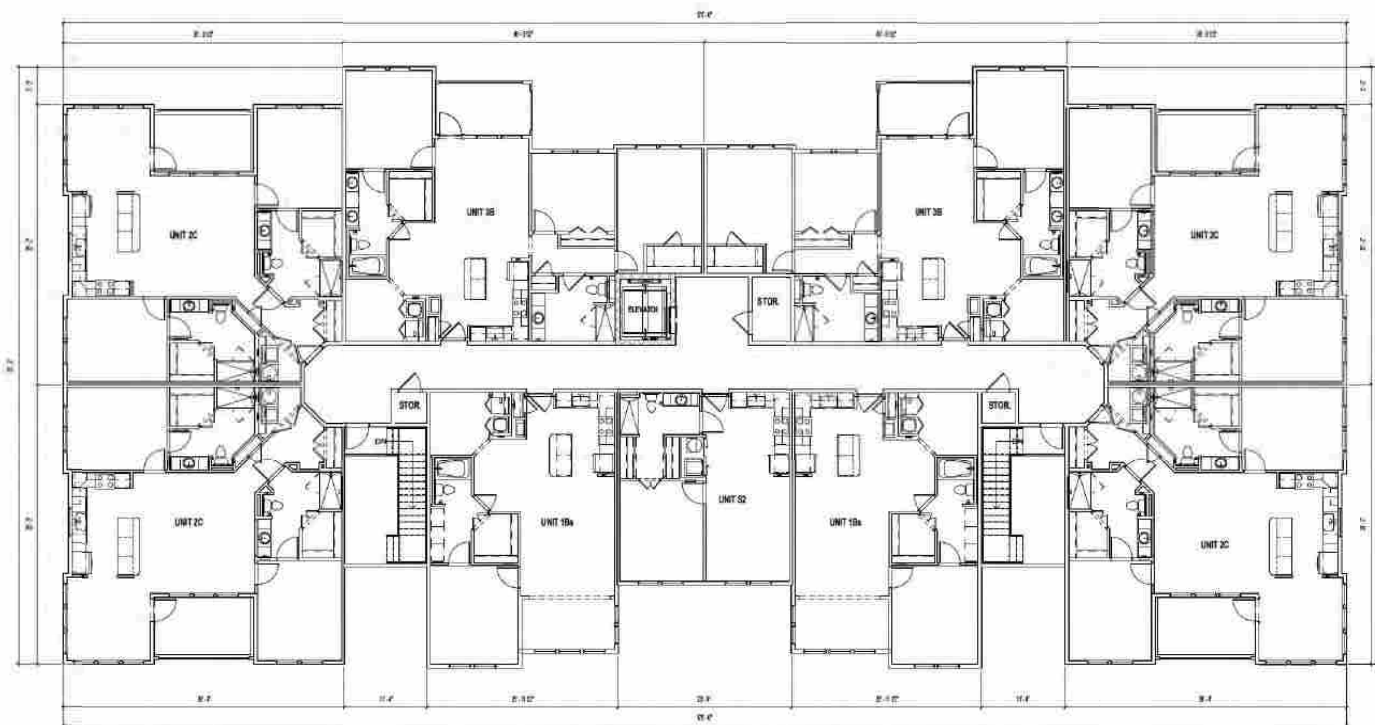
BLDG. TYPE B - 3RD LEVEL PLAN

 $10^2 = 1.0$ 

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FARRAGUT TOWN CENTER
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PASSAGE 1



1 BLDG. TYPE B - 4TH LEVEL PLAN
1/8" = 1'-0"



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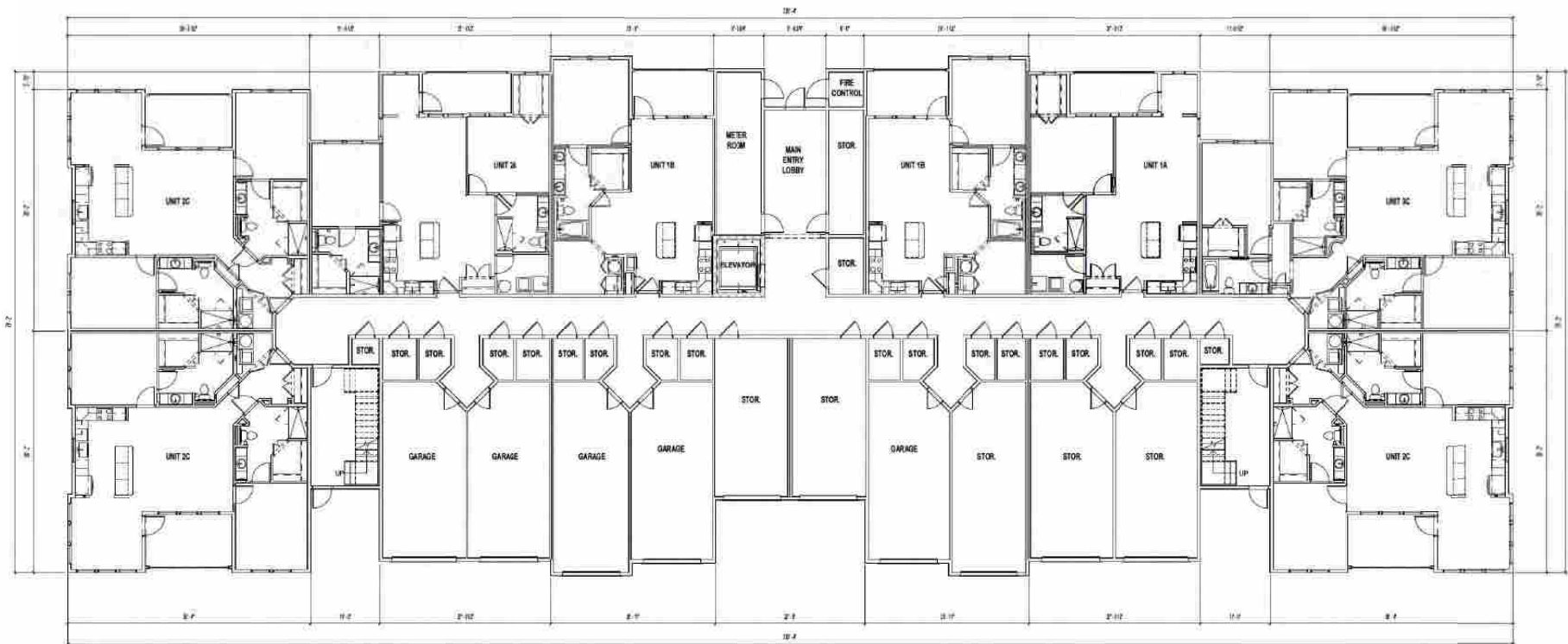
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H1 BLDG. TYPE C - GROUND LEVEL PLAN
1/8" = 1'-0"



BUILDING TYPE C - GROUND LEVEL PLAN

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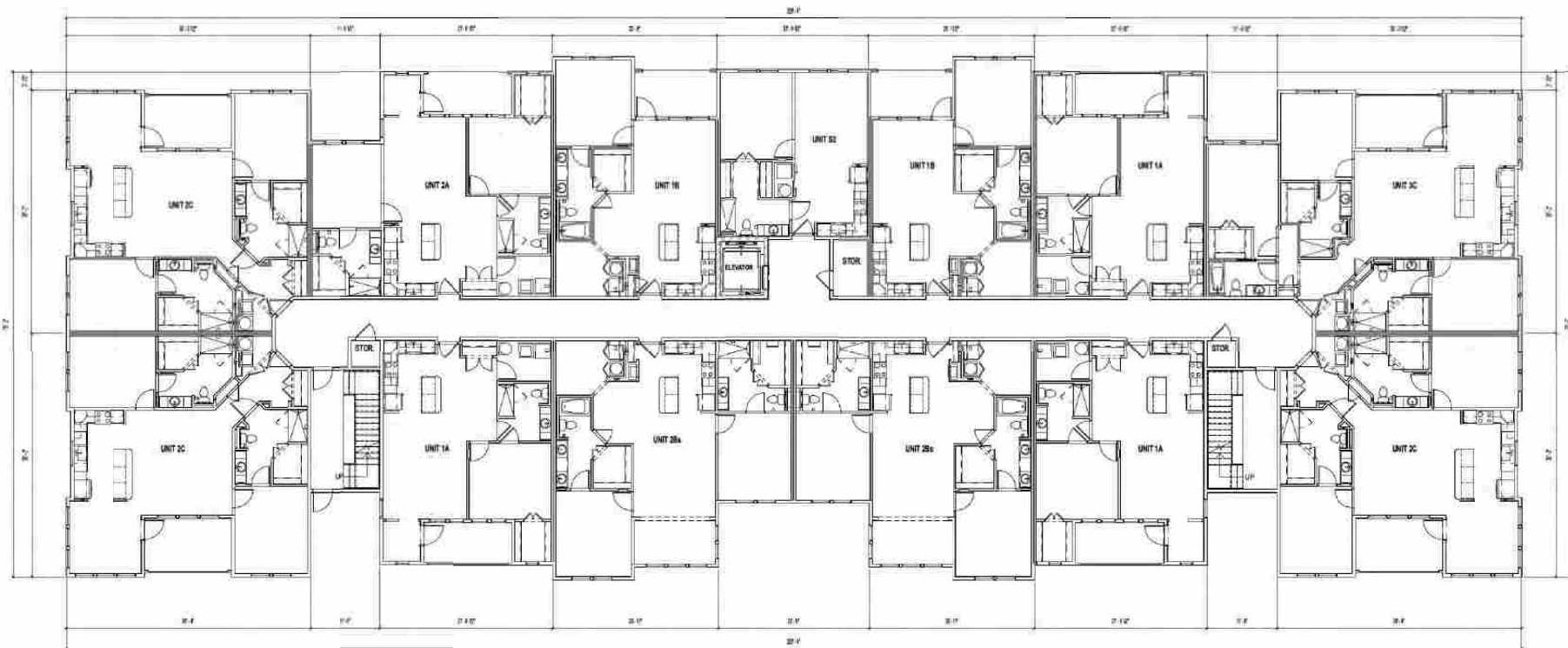
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PROJECT: 0401 DATE: 10/15/20 FARRAGUT, TN



H1 BLDG TYPE C - 2ND LEVEL PLAN
1/8" = 1'-0"

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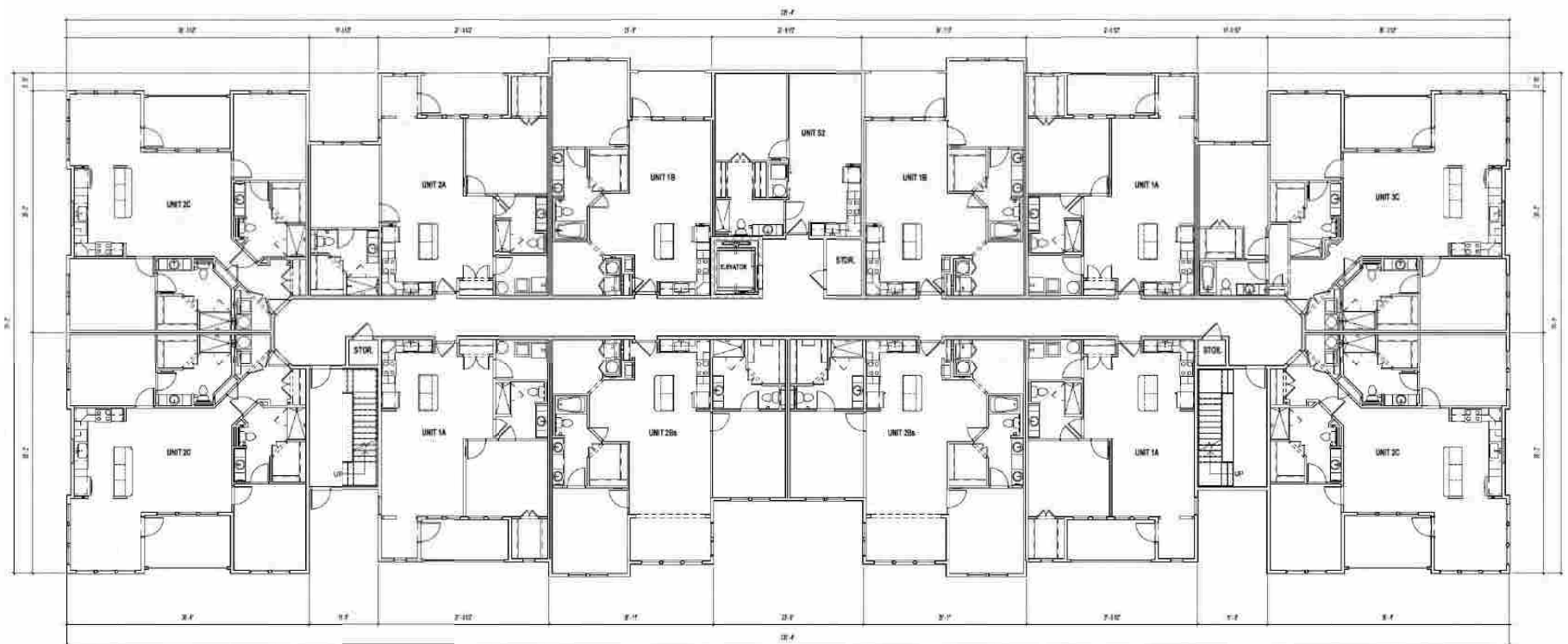
BLDG. TYPE C - 2ND LEVEL PLAN

FARRAGUT TOWN CENTER @ BIDDLE FARMS

PROJECT: 2481 DATE: 10/10/09 FARRAGUT, TN

3

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H1 BLDG TYPE C - 3RD LEVEL PLAN
1/8" = 1'-0"



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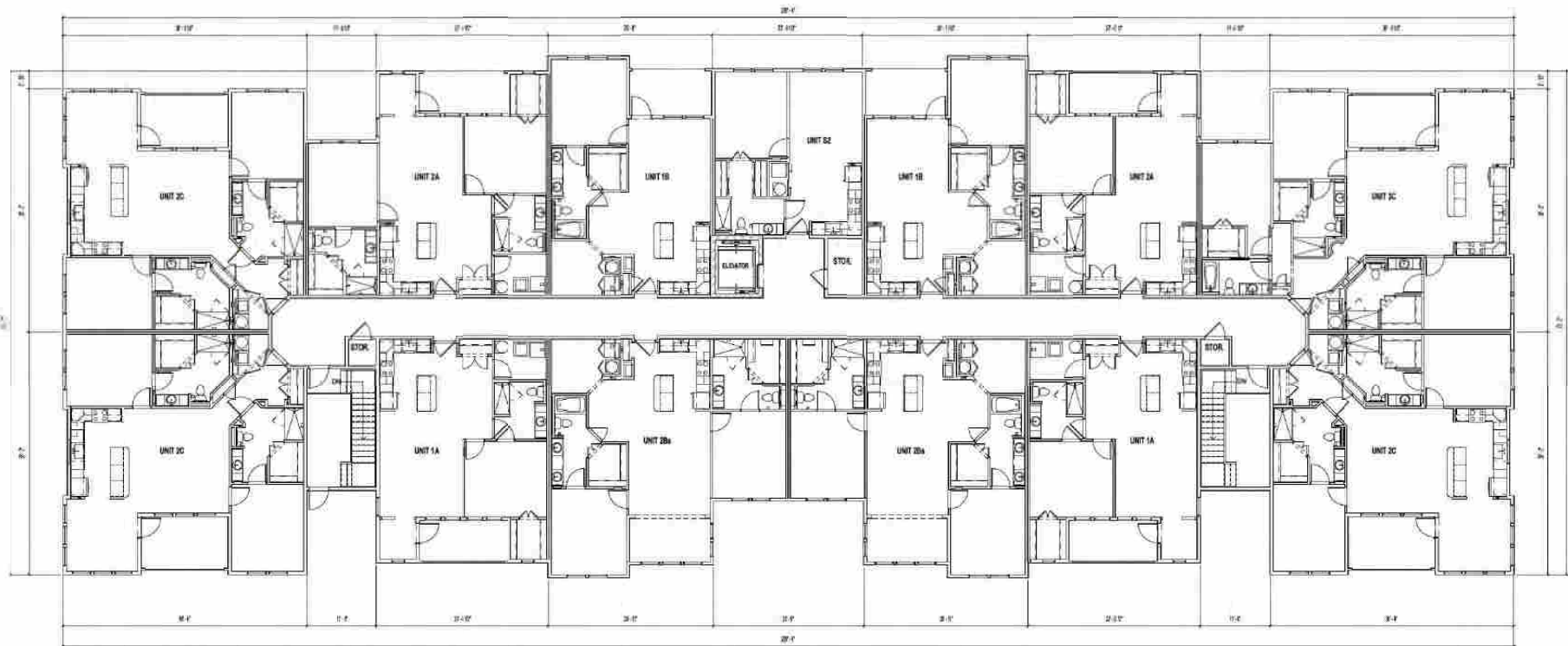
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H1 BLDG. TYPE C - 4TH LEVEL PLAN
1/8" = 1'-0"



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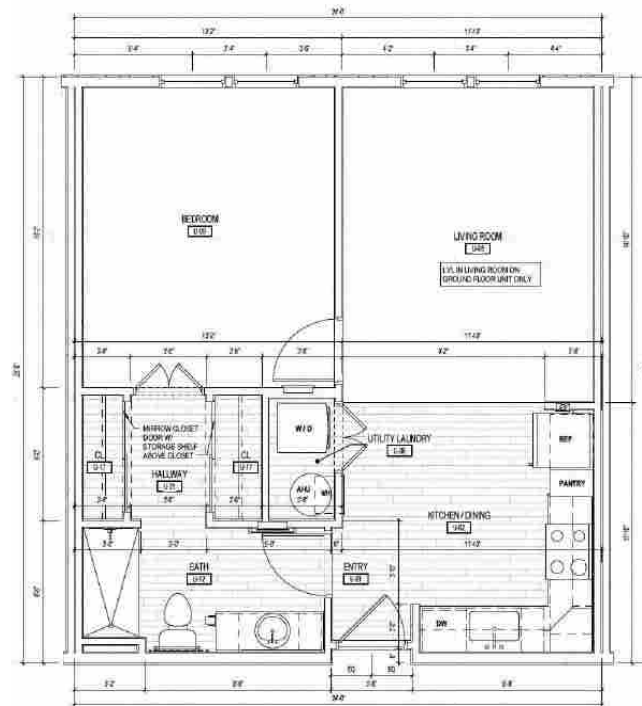
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H5 UNIT S2 - DIMENSIONS & REFERENCE PLAN
3/8" = 1' 0"

AREA - S2
1BR - 1 BATH
SQUARE LIVING (SPACE) = 811 Sq. Ft.
NET RENTABLE = 813 Sq. Ft.



FARRAGUT TOWN CENTER UNIT S2 - 1BR. UNIT PLAN @ BIDDLE FARMS

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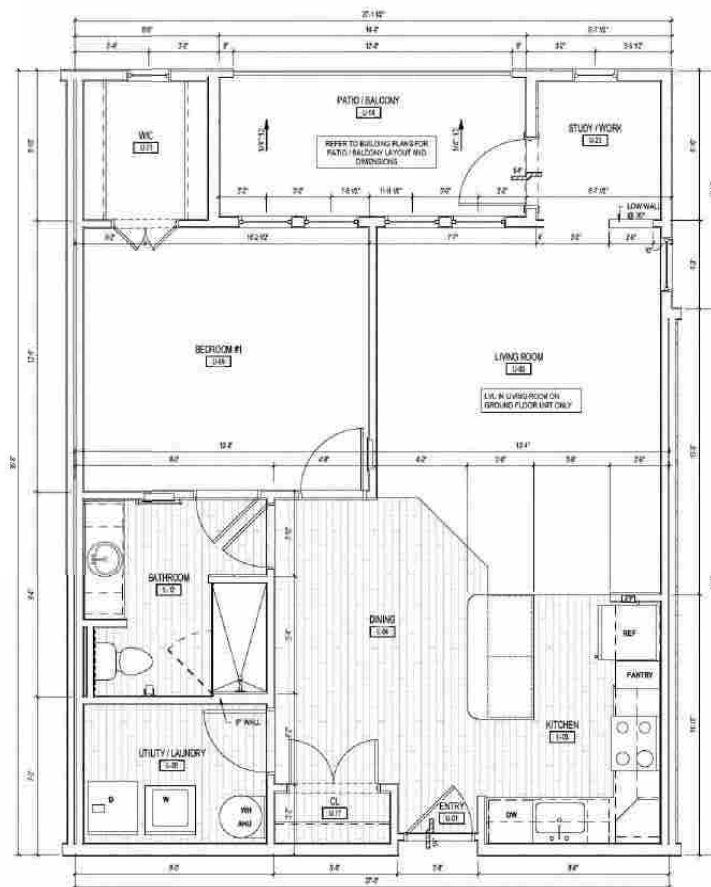
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H5 UNIT 1A - DIMENSION & REFERENCE PLAN
3/20/11

AREA - UNIT 1A	
1BR, 1 BATH	
GROSS LIVING AREA	880 Sq. Ft.
PATIO/BALCONY	80 Sq. Ft.
NET REMAINABLE	800 Sq. Ft.



FARRAGUT TOWN CENTER UNIT 1A - 1BR UNIT PLAN @ BIDDLE FARMS

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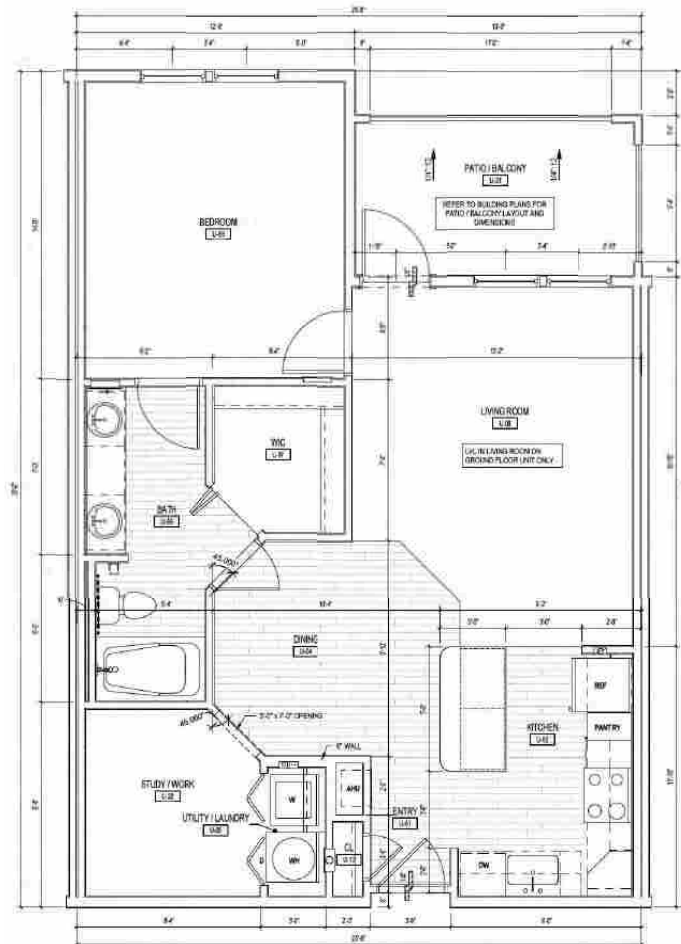
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H5 UNIT 1B - DIMENSION & REFERENCE PLAN
3/8" = 1'-0"

AREA - UNIT 1B	
11'0" x 11'0"	
GROSS LIVING SPACE	= 80 Sq. Ft.
PATIO/BALCONY	= 10 Sq. Ft.
NET RENTABLE	= 90 Sq. Ft.

UNIT 1B - 1BR. UNIT PLAN

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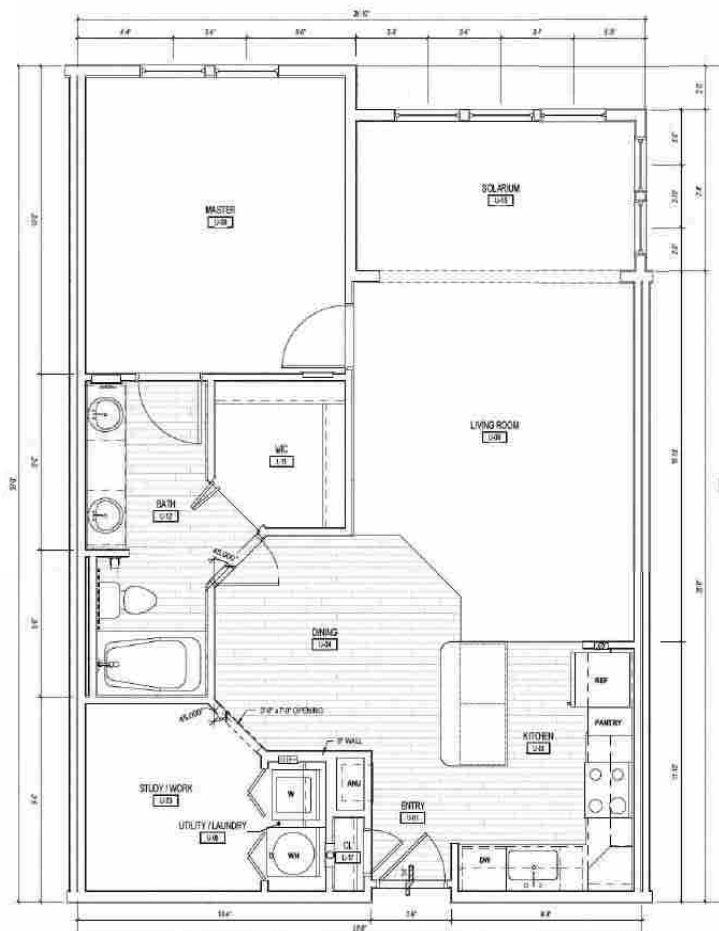
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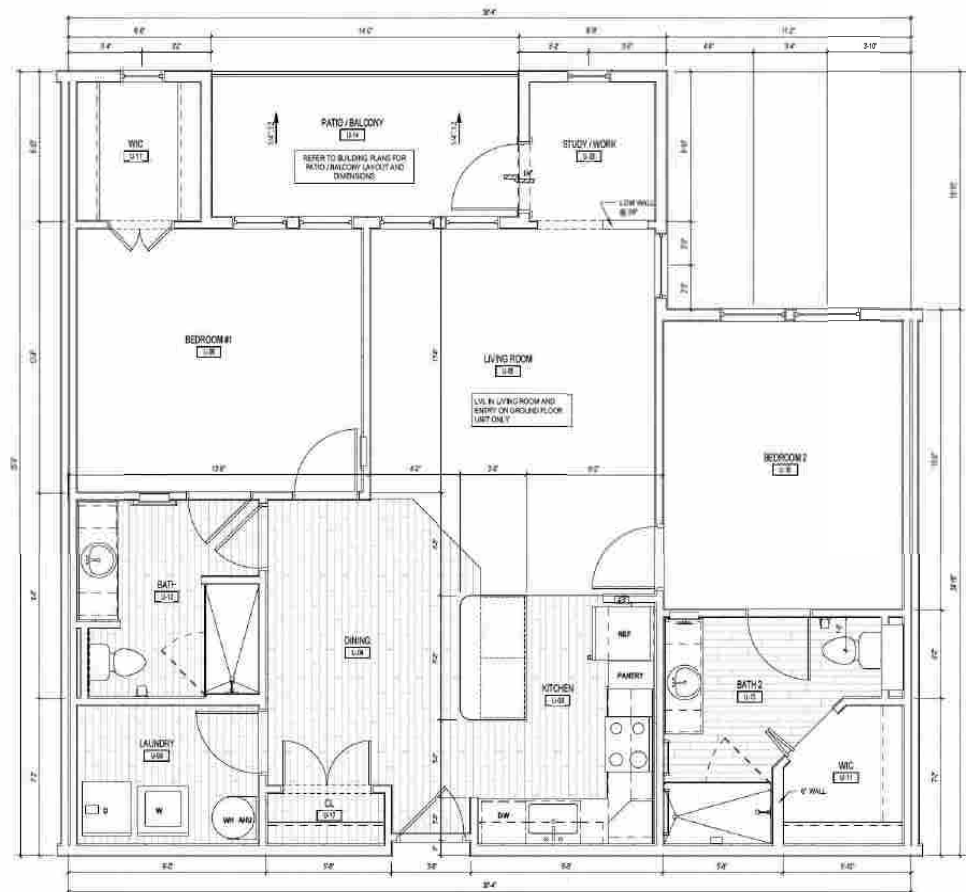


H5 UNIT 1Bs - W/ SOLARIUM - DIMENSION & REFERENCE PLAN
38'0" x 38'0"

AREA - UNIT 1Bs	
1 BR - 1 BATH	
GROSS LIVING (PAC) = 946 Sq. Ft.	
NET RENTABLE	= 880 Sq. Ft.

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H5 UNIT 2A - DIMENSION & REFERENCE PLAN
3/8" = 1'-0"

AREA - UNIT 2A
2 BR - 2 BATH
GROSS LIVING AREA = 145 Sq. Ft.
PATIO/BALCONY = 11 Sq. Ft.
NET RENTABLE = 156 Sq. Ft.



FARRAGUT TOWN CENTER UNIT 2A - 2BR UNIT PLAN @ BIDDLE FARMS

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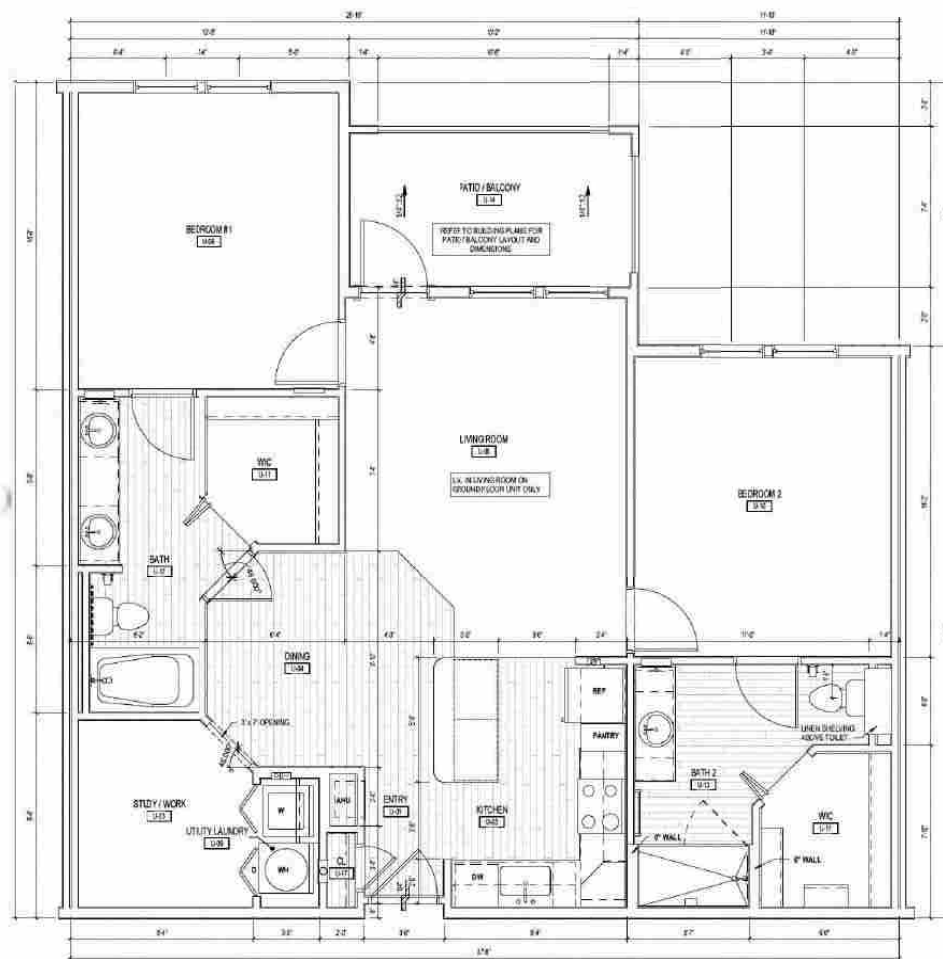
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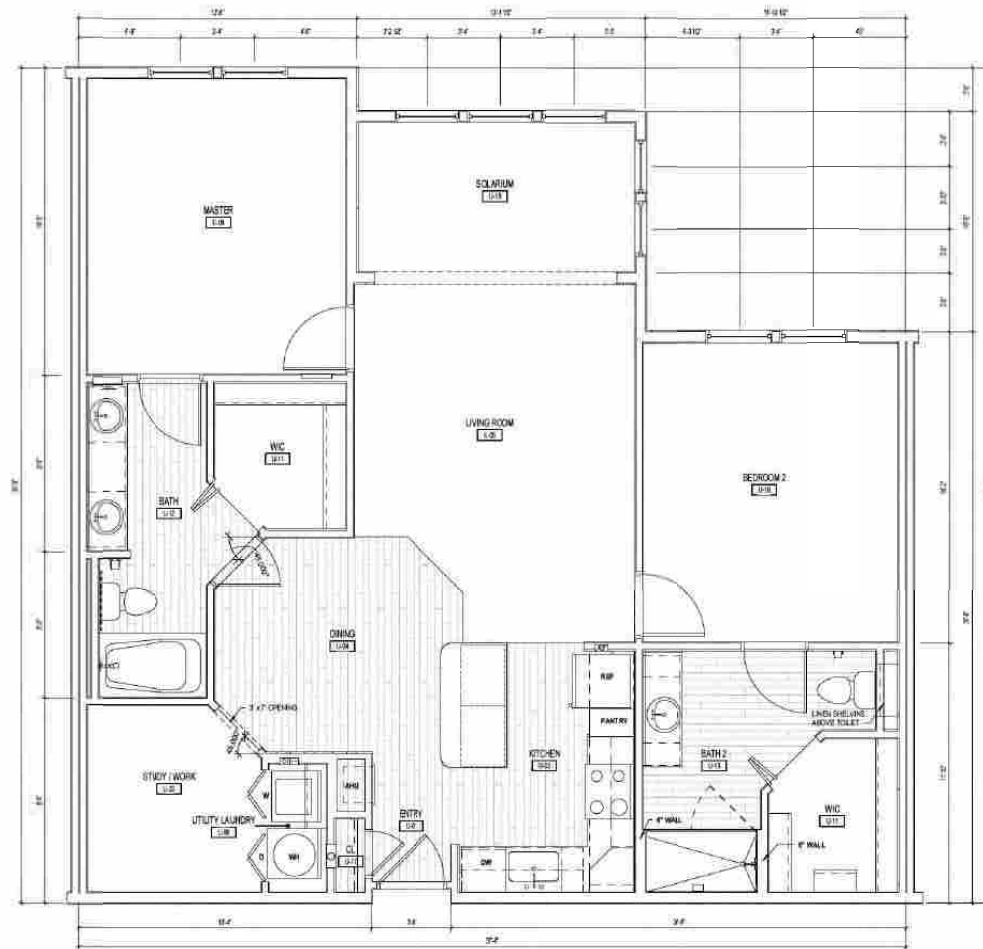
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H5 UNIT 2Bs - WITH SOLARIUM - DIMENSION & REFERENCE PLAN
38' x 14'

AREA - UNIT 2Bs	
1BR - 1 BATH	
GROSS LIVING (HVAAC) = 1,281 Sq. Ft.	
NET RENTABLE = 1,288 Sq. Ft.	



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FARRAGUT TOWN CENTER @ BIDDLE FARMS

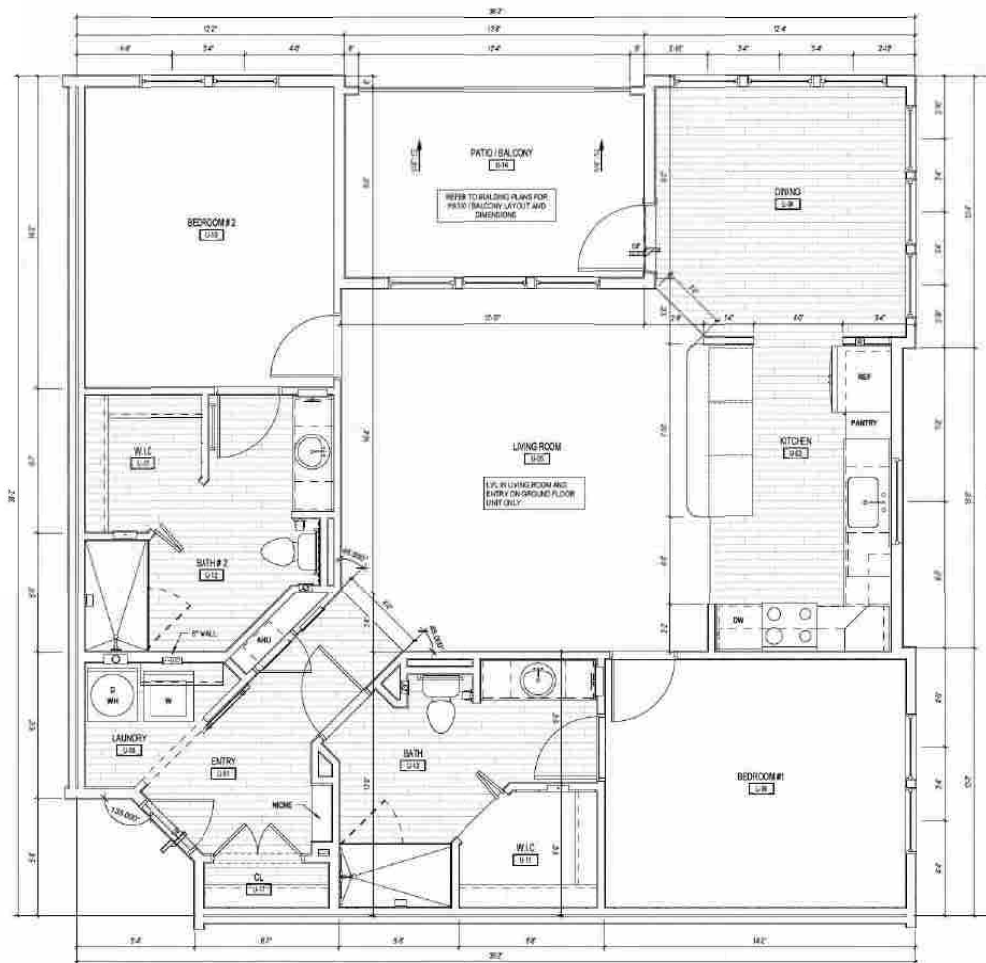
2BR WITH SOLARIUM UNIT 2Bs

PROJECT No. 041 DATE: 10/15/20 FARRAGUT, TN

FAX: 407-626-1057

AA2000210

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H5 UNIT 2C - DIMENSIONS & REFERENCE PLAN
30" x 10"

FARRAGUT TOWN CENTER @ BIDDLE FARMS UNIT 2C - 2BR UNIT PLAN



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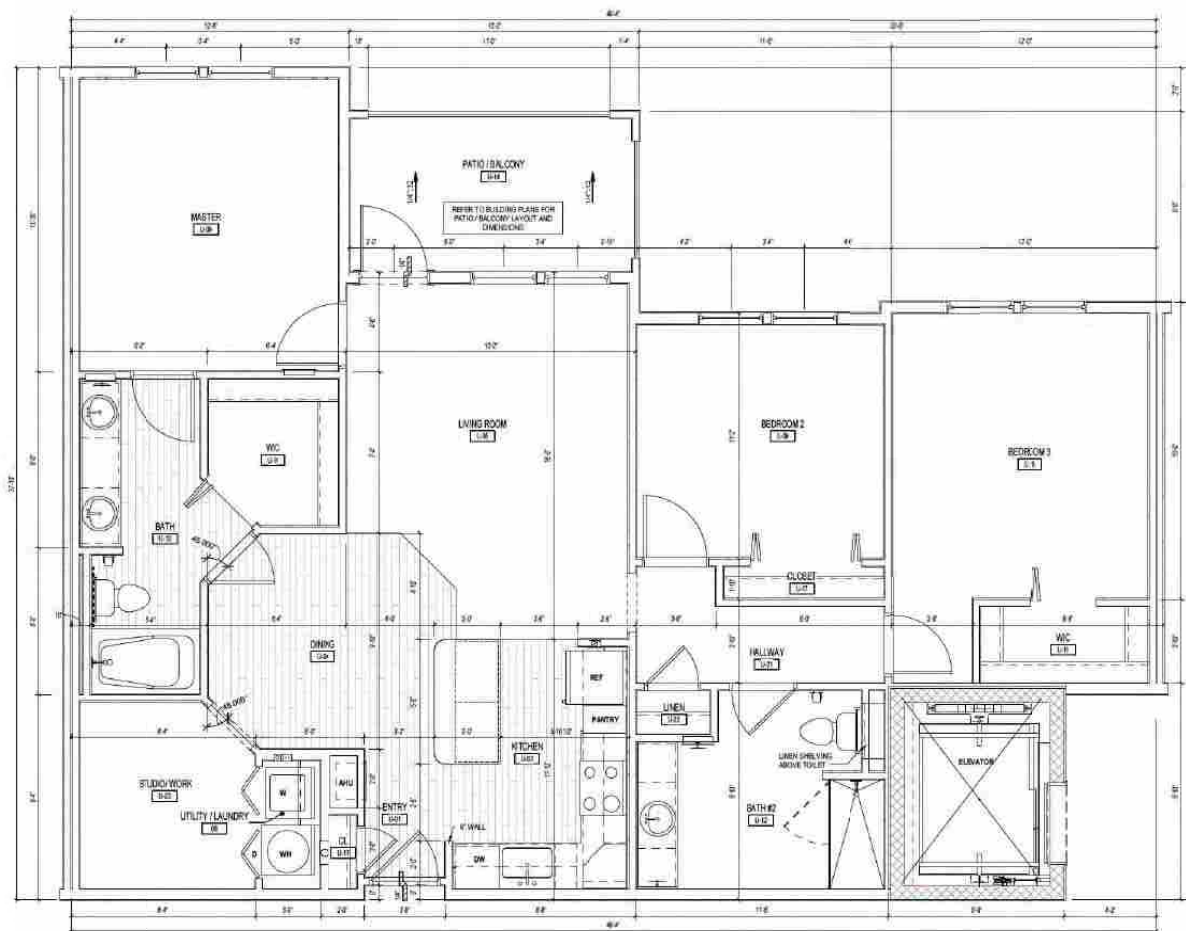
WINTER PARK, FLORIDA 32789

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FAX: 407-626-1057

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H4 UNIT 3B - DIMENSION & REFERENCE PLAN
3B' x 14'

AREA - UNIT 3B	
3 BR. - 3 BATH	
GROSS LIVING (WALL) = 1,281 Sq. Ft.	
PATIO/BALCONY = 95 Sq. Ft.	
NET RENTABLE = 1,376 Sq. Ft.	



FARRAGUT TOWN CENTER UNIT 3B - 3BR UNIT PLAN @ BIDDLE FARMS

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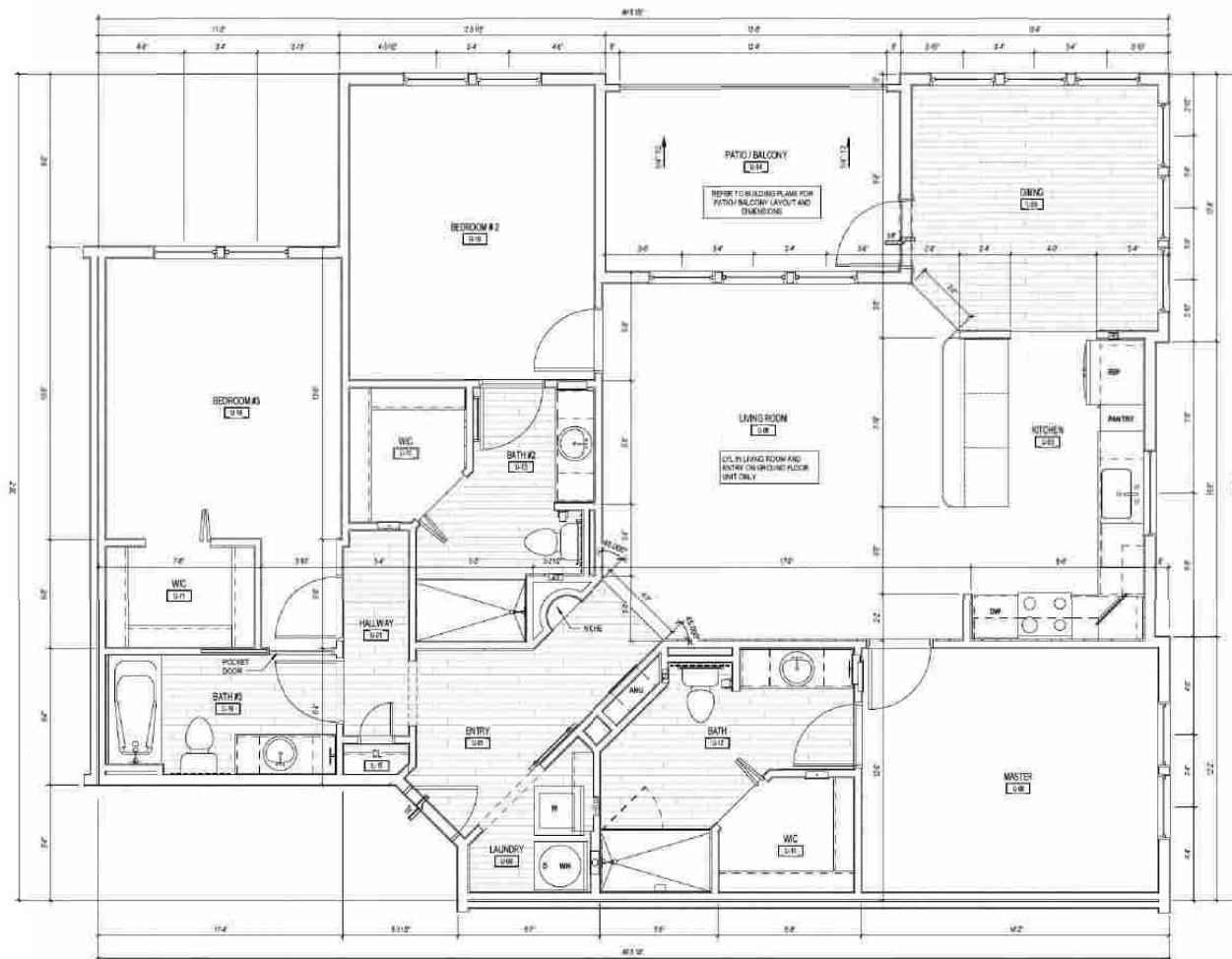
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H5 UNIT 3C - DIMENSIONS & REFERENCE PLAN
39'-11/2"

FARRAGUT TOWN CENTER UNIT 3C - 3BR UNIT PLAN @ BIDDLE FARMS



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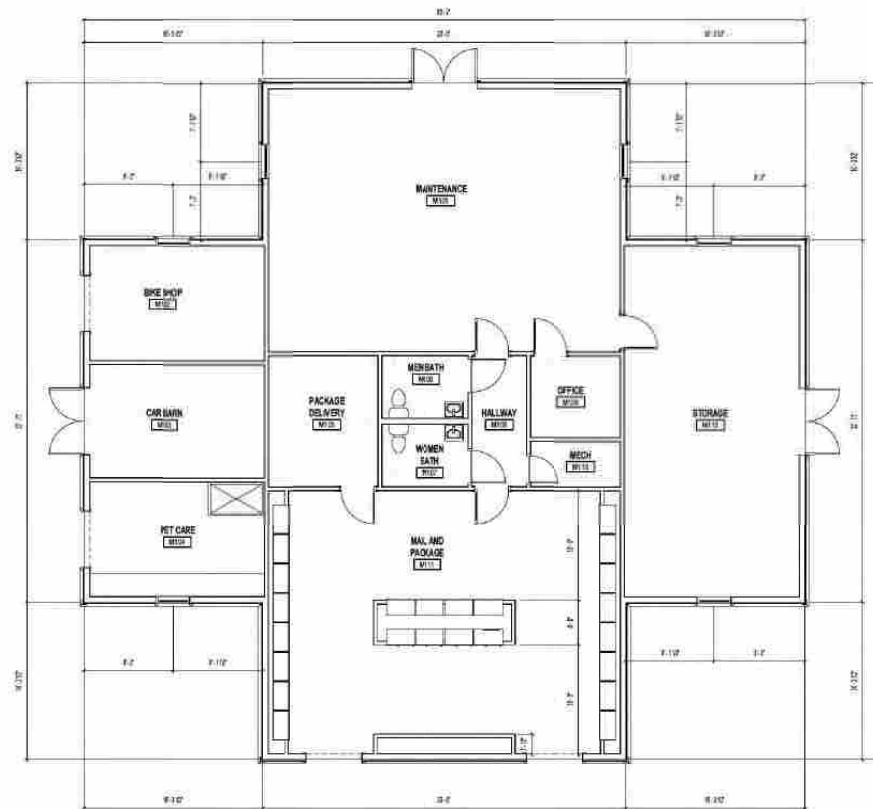
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H1 MAINT. BLDG. - GROUND LEVEL
3/16" = 1'-0"



MAINTENANCE BUILDING FLOOR PLAN

FARRAGUT TOWN CENTER
@ BIDDLE FARMS

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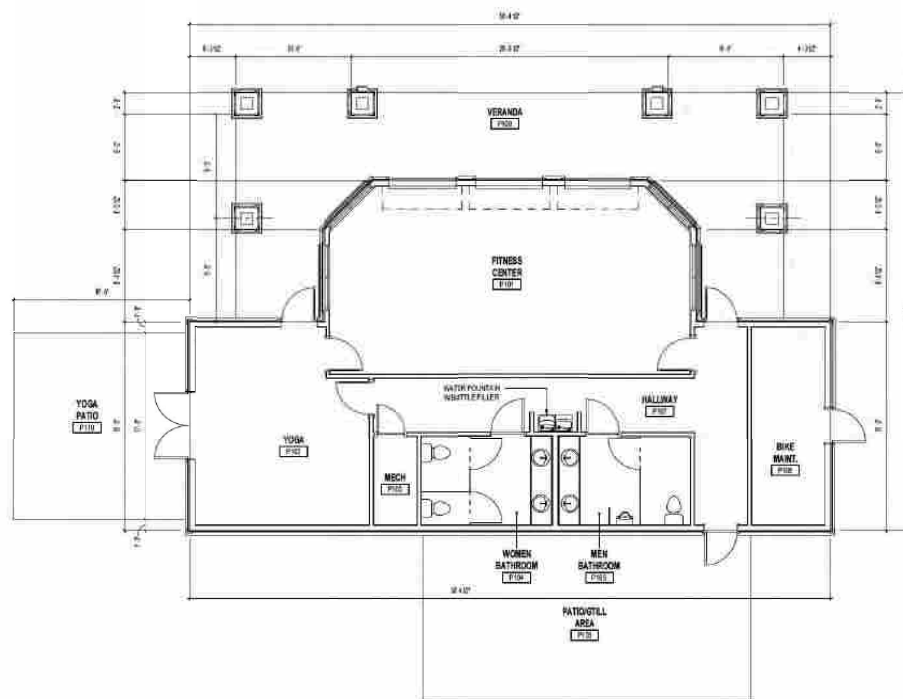
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TEL: 407-629-0585

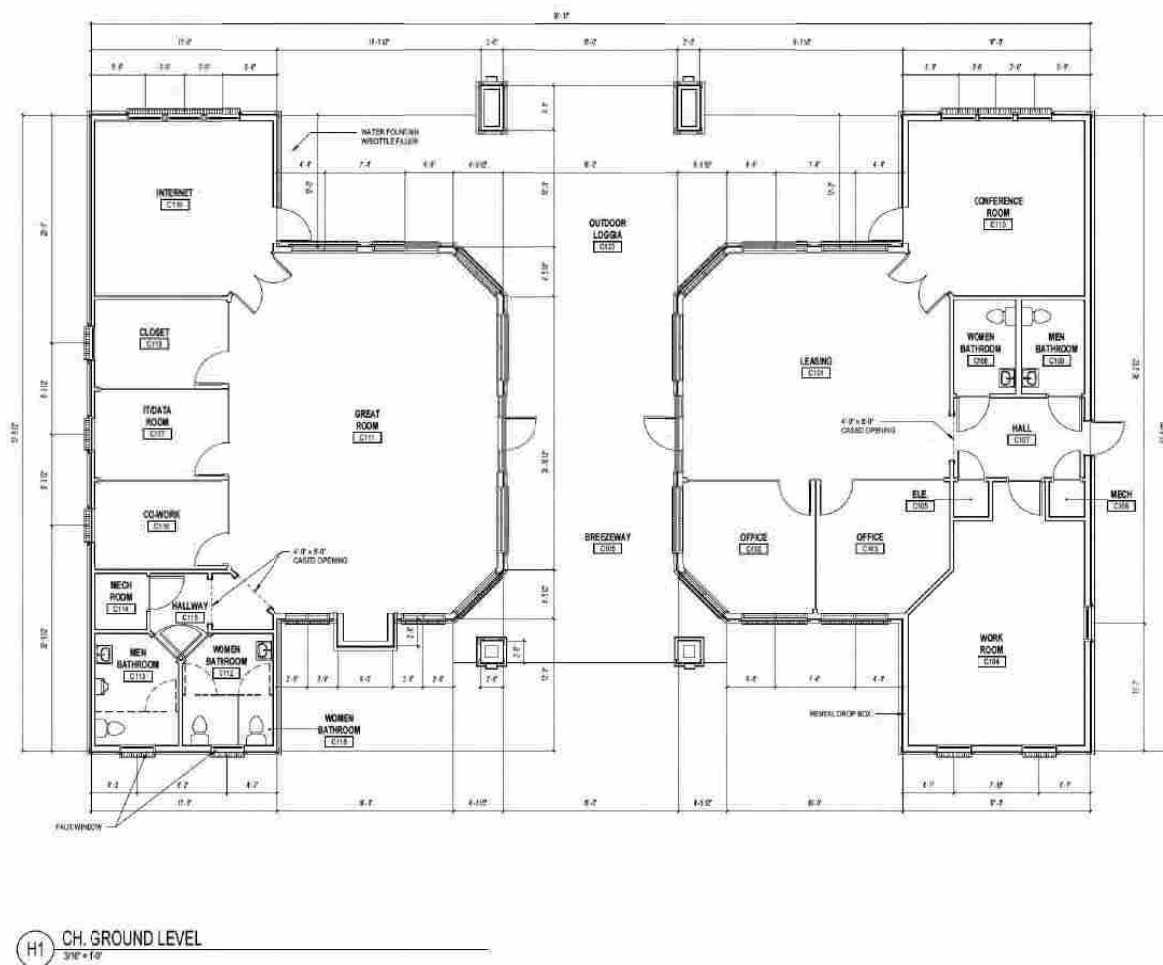
FAX: 407-620-1057

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H1 POOL/FITNESS. BLDG. - GROUND LEVEL
30'0" x 28'0"



CLUBHOUSE FLOOR PLAN

FARRAGUT TOWN CENTER
@ BIDDLE FARMS

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BUILDING TYPE A - FRONT ELEVATION

BUILDING HEIGHT 49'-1"



BUILDING TYPE A - SIDE ELEVATION

BUILDING HEIGHT 49'-1"

ALL ELEVATIONS TO CONTAIN A
MINIMUM OF 75% FACE BRICK PER
JURISDICTIONAL REQUIREMENTS



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BUILDING TYPE A - ELEVATIONS

FARRAGUT TOWN CENTER @ BIDDLE FARMS

PROJECT No. 5461 DATE: 05/2009

FARRAGUT TOWN CENTER



BUILDING TYPE A - REAR ELEVATION BUILDING HEIGHT 49' - 1"

ALL ELEVATIONS TO CONTAIN A
MINIMUM OF 75% FACE BRICK PER
JURISDICTIONAL REQUIREMENTS



BUILDING TYPE A - ELEVATIONS

FARRAGUT TOWN CENTER @ BIDDLE FARMS

PROJECT: 0451 DATE: 10/15/20 FARRAGUT, TN

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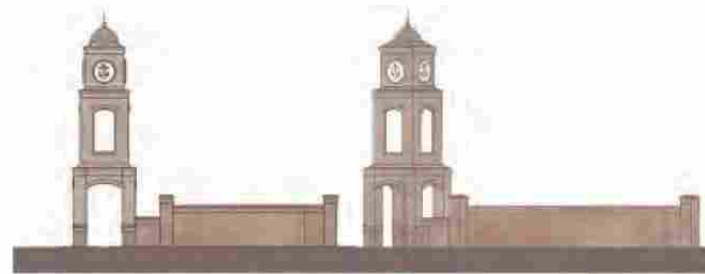
AA2600210

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CLUBHOUSE - FRONT ELEVATION

CLUBHOUSE - SIDE ELEVATION



MONUMENT - FRONT

MONUMENT - SIDE

ALL ELEVATIONS TO CONTAIN A
MINIMUM OF 75% FACE BRICK PER
JURISDICTIONAL REQUIREMENTS



CLUBHOUSE & ENTRY MONUMENT ELEVATIONS

FARRAGUT TOWN CENTER @ BIDDLE FARMS

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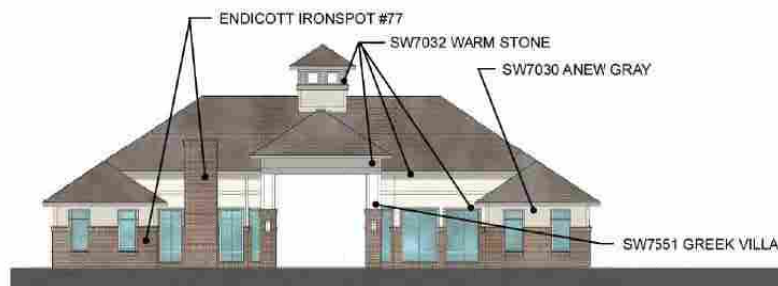
BUILDING TYPE A - FRONT ELEVATION

BUILDING MAIN ENTRY
(SECONDARY ENTRIES AT STAIRS
AT REAR OF BUILDING)

BUILDING HEIGHT 49'- 1"

BUILDING TYPE A - SIDE ELEVATION

ALL ELEVATIONS TO CONTAIN A
MINIMUM OF 75% FACE BRICK PER
JURISDICTIONAL REQUIREMENTS



CLUBHOUSE - FRONT ELEVATION



CLUBHOUSE - SIDE ELEVATION



MONUMENT - FRONT

MONUMENT - SIDE



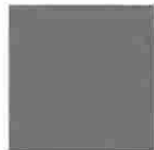
SW7030
ANEW GRAY
BODY 1



SW7541
GRECIAN IVORY
BODY 2



SW7032
WARM STONE
TRIM 1



SW7019
GAUNTLET GRAY
TRIM 2 & RAILING



SW7009
GREEK VILLA
TRIM 3 COLUMNS



CERTAINTEED
WEATHERED WOOD



ENDICOTT FACE BRICK
MED. IRONSPOT#77
VELOUR TEXTURE



ENDICOTT FACE BRICK
LIGHT SANDSTONE
VELOUR TEXTURE



ARCHITECTURAL COLOR SCHEME

PROJECT NO: 5451 DATE: 10/15/20

FARRAGUT TOWN CENTER @ BIDDLE FARMS

FARRAGUT, TN

EXTERIOR FINISH SCHEDULE		
KEY	MATERIAL / MFG	COLOR / NO.
1	PREPARED METAL CORNER	AT: DARK GRAY AS: 3000MILS/INCH
2	BRICK	
3	BRICK	
4	CONCRETE BLOCK	BRICK TACTS IF SAME COLOR
5	CONCRETE BLOCK	BRICK TACTS IF SAME COLOR
6	CONCRETE BLOCK	BRICK TACTS IF SAME COLOR
7	CONCRETE BLOCK	BRICK TACTS IF SAME COLOR
8	CONCRETE BLOCK	BRICK TACTS IF SAME COLOR
9	CONCRETE BLOCK	BRICK TACTS IF SAME COLOR
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98	CONCRETE BLOCK	BRICK TACTS IF SAME COLOR
99	CONCRETE BLOCK	BRICK TACTS IF SAME COLOR
100	CONCRETE BLOCK	BRICK TACTS IF SAME COLOR



4 Side Elevation



3 Side Elevation



2 Rear Elevation



1 Side Elevation

QUANTITY	UNIT	PER SQ. FT.	TOTAL
1	100	100	100
2	100	100	100
3	100	100	100
4	100	100	100
5	100	100	100
6	100	100	100
7	100	100	100
8	100	100	100
9	100	100	100
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REVISIONS	DATE
1	
2	
3	
4	
5	
6	
7	
8	
9	

REVISIONS	DATE
1	
2	
3	
4	
5	
6	
7	
8	
9	

SGA Design Group, P.C.
1437 South Boulevard, Suite 200
Tomball, Texas 77375
P: 281.358.8800
F: 281.358.8801
www.sgadesigngroup.com

PRELIMINARY - NOT FOR CONSTRUCTION

Store #:06
Farragut, TN
11238 Kingston Pike
Knoxville, TN 37922
Knox County
Project Name & Location:

Exterior Elevations
Drawing Name:
Project No.
Date: 11/09/20
Type: V7.00T
A-201
Scale: As Noted
Drawing No.



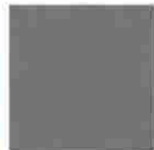
SW7030
ANEW GRAY
BODY 1



SW7541
GRECIAN IVORY
TRIM 1



SW6076
TURKISH COFFEE
BODY 2



SW7019
GAUNTLET GRAY
TRIM 2 & RAILING



ENDICOTT FACE BRICK
LIGHT SANDSTONE
VELOUR TEXTURE

ALL ELEVATIONS TO CONTAIN A
MINIMUM OF 75% FACE BRICK PER
JURISDICTIONAL REQUIREMENTS



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ARCHITECTURAL COLOR SCHEME

PROJECT NO: 5451 DATE: 10/15/20

FARRAGUT TOWN CENTER @ BIDDLE FARMS

FARRAGUT, TN



19142024 450101 PM

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BUILDING HEIGHT 49'-1"

FARRAGUT TOWN CENTER
@ BIDDLE FARMS

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PROJECT No. 5481

DATE: 12/15/09

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BUILDING HEIGHT 49'-1"

FARRAGUT TOWN CENTER
@ BIDDLE FARMS

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BUILDING HEIGHT 49'-1"

FARRAGUT TOWN CENTER
@ BIDDLE FARMS

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PROJECT No. 5481

DATE: 10/15/20

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FARRAGUT TOWN CENTER
at Biddle Farms

Conceptual Iconic Element at Main Street Entrance

Main Street Entry Iconic Element - The tower elements will straddle the sidewalk into the development as a pedestrian gateway and flank the drive lane as vehicle gateway. The flanking walls are intended as both a grade wall as well as project identification. The towers borrow from historic gateway formations and employs brick as the primary structure face. The vertical tiers contain a mid-level with a back lit panel that could be used for "feature events" as if an illuminated street poster. The top circle could contain the development logo.



FARRAGUT TOWN CENTER @ Biddle Farms

Conceptual Signage Vision

The overall objective of the proposed Town Center's conceptual signage vision is provide a consistent, effective, and unified approach to assist the citizens of the Town of Farragut convenient identification of the tenants of the project, and allows the tenants ample opportunities to promote their brands and assist in navigation to their store locations.

All Signage shall meet the Farragut Municipal Code signage requirements.

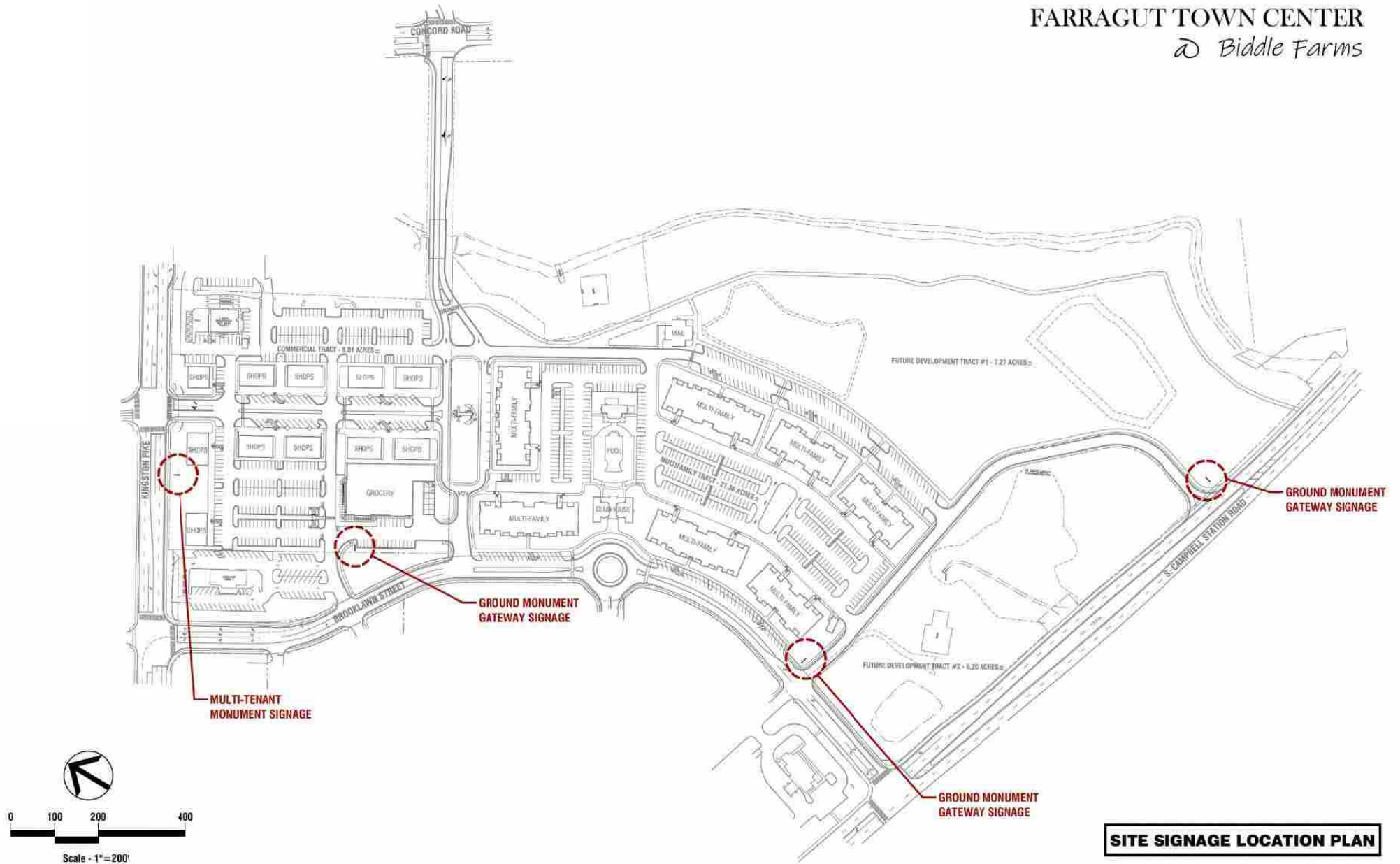
Several types of signage proposed for the project include:

- **Multi-Tenant Monument Signage** - The priority of this signage is frontage identification for the users that would otherwise be lined up in a lineal row all facing the street in the manner of the prior retail development. In the aggregate the proposition does not increase the global allocation of signage found in more conventional solutions. Rather it repositions it to add orientation, invitation, and retail activity to the Main Street, which is the focus of the "town center" concept.
- **Ground Monument Gateway Signage** - The ground monument signage similarly replaces a host of individual signs had the site been platted to allow for each building and tenant to have their own "fee simple" parcel. Their positioning along the secondary roads is in return replacing signage for many internal users organized in another development pattern than a town center model.
- **Primary Building Signage** – This signage is proposed to present a consistent approach regarding signage size and presentation while allowing retailers the opportunity to present their brand with little or no compromise. Both wall signage and under canopy blade signage are proposed.
- **Wayfinding & Accent Signage** – This signage, often cast at corners or suspended from cross arms of light standards that support multiple suspended signage shingles in a series with arrows pointing in the direction of each institution are



FARRAGUT TOWN CENTER

at Biddle Farms



FARRAGUT TOWN CENTER

by Biddle Farms

THIS PROPERTY WILL BE
RETAINED BY THE BIDDLE
FAMILY AND IS LOCATED IN
THE AQUATIC BUFFER AREA
THAT CANNOT BE DISTURBED

- OPEN/GREEN SPACE TO BE MAINTAINED BY
THE DEVELOPER (7.20 ACRES±)
- OPEN/GREEN SPACE TO BE DEDICATED AND
MAINTAINED BY THE TOWN (5.60 ACRES±)

PROPOSED VILLAGE
GREEN

EXISTING HORSE
BARN

PROPOSED WALKING
TRAIL (20' EASEMENT
PROVIDED)

FUTURE DEVELOPMENT TRACT #1 - 7.27 ACRES±

8' SIDEWALK ADJACENT
TO PARKING AND WITHIN
WALKING TRAIL LOOP

KINGSTON PINE

BROOKLAWN STREET

PROPOSED
PEDESTRIAN
PATH

PROPOSED
PEDESTRIAN
PATH

FUTURE DEVELOPMENT TRACT #2 - 6.20 ACRES±

HIGHLIGHTED AREA
DENOTES 3,400±
WALKING TRAIL LOOP

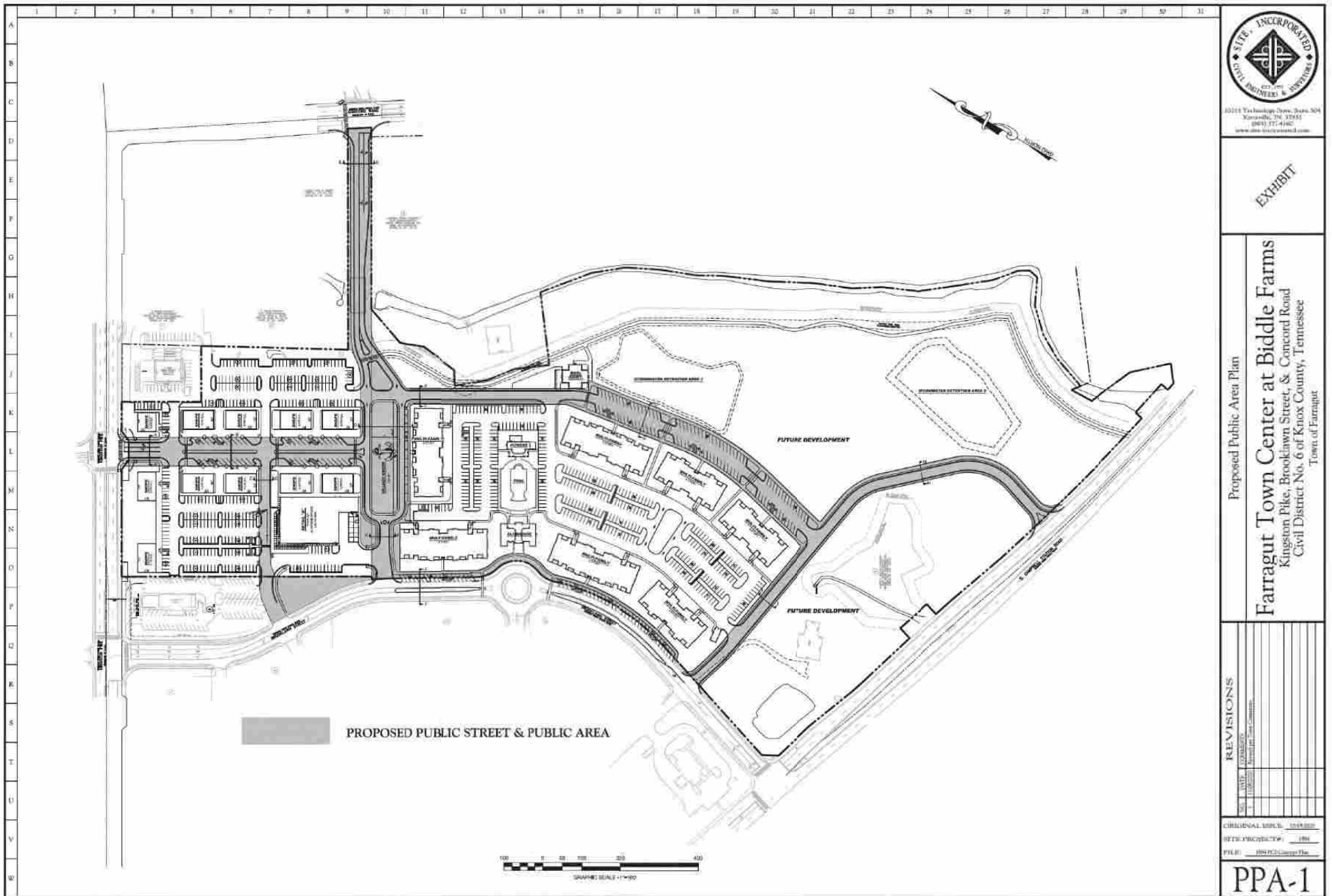
S. CAMPBELL SYRISON ROAD

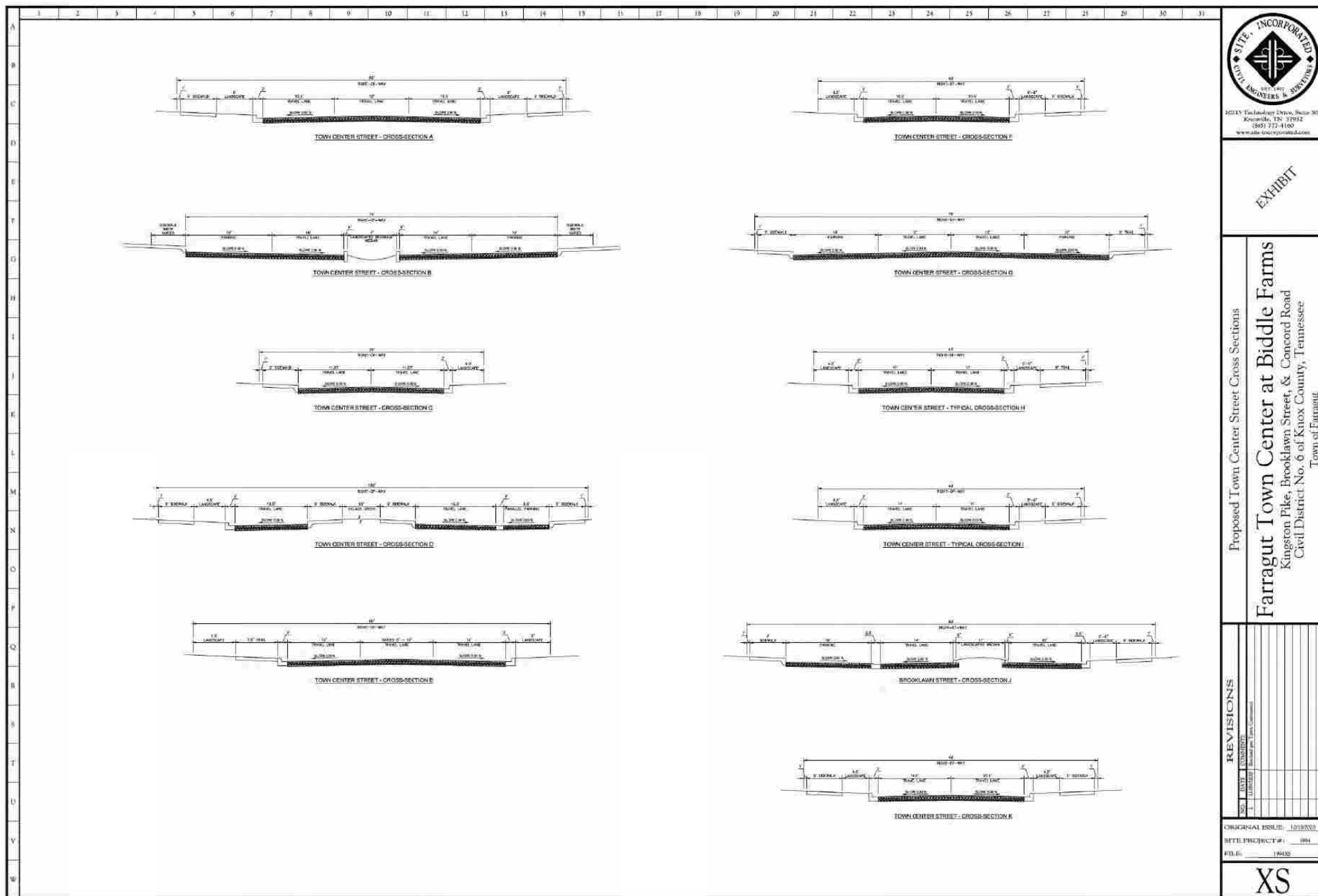


0 100 200 400

Scale - 1" = 200'

**COMMON SPACE AND PEDESTRIAN
ACCESS EXHIBIT**



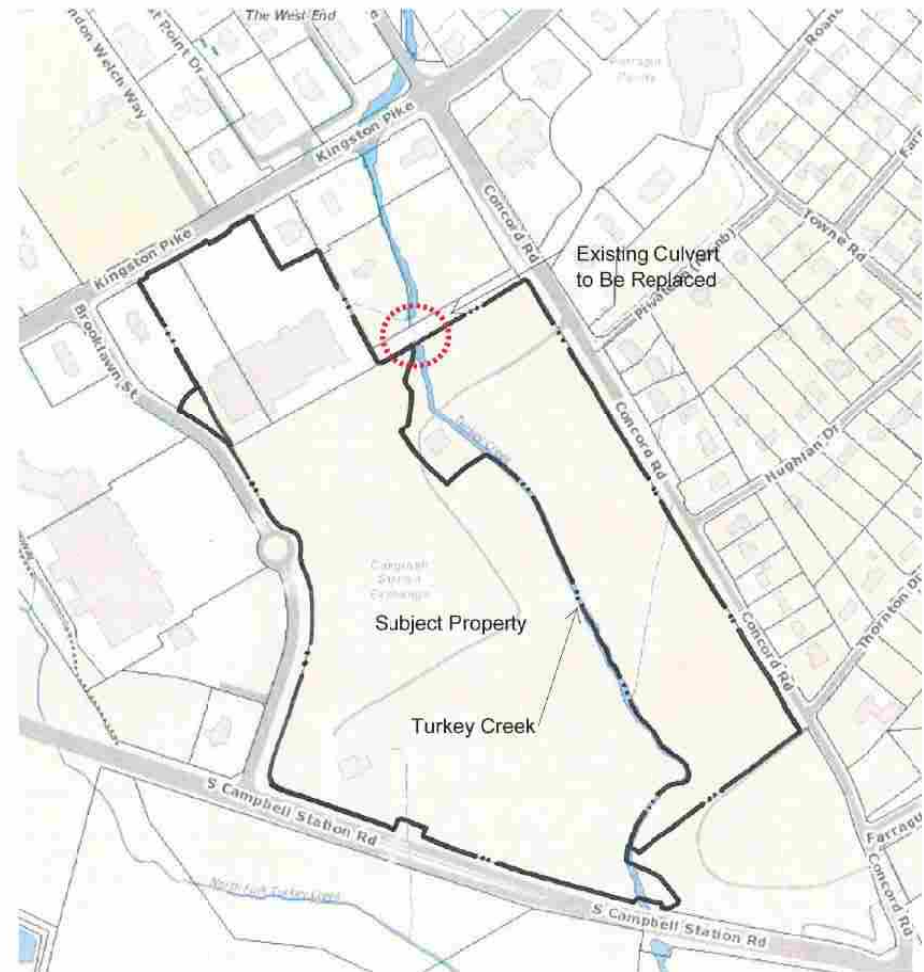


Hydraulic & Hydrology Study Summary and Recommendations

Hydraulic and hydrology models were requested and received from FEMA for both Turkey Creek and North Fork Turkey Creek. The results of both models match the effective results as shown in the Flood Insurance Study (FIS) number 47093CV001B. Both models were updated with new ground data as gathered by our project surveyor. The Base Flood Elevation (BFE) results for both Turkey Creek and North Turkey Creek models were verified to become the Existing Conditions Model (ECM).

From this point, the ECM was used to create the Proposed Conditions Model (PCM). The PCM included the conceptual layout for the development called "Farragut Town Center at Biddle Farms" provided by SITE Inc.

Based upon the results of the hydrology study, not only can the proposed development be constructed, but along with the new bridge over Turkey Creek and other measures undertaken will also help alleviate some of the existing conditions.



Traffic Impact Study Summary and Recommendations

The study of the Biddle Farms, a proposed mixed commercial and residential development evaluated the projected traffic conditions. Background traffic was determined using a 3.5-percent annual compounded growth rate until the horizon year 2025. Traffic associated with the proposed project was then generated and distributed to the proposed site accesses. The proposed site may generate approximately 8,480 daily weekday trips. After the consideration of pass-by traffic and internal trips, approximately 6,730 new daily trips (Primary) may be generated for a typical weekday. Using the identified turning movements for the projected traffic conditions, unsignalized and signalized capacity and level of service analyses were conducted using the **2000 Highway Capacity Manual**.

Current conditions for study intersections are LOS E or better. Intersections are operating with a minimum LOS C except for the Kingston Pike intersections with Campbell Station Road and Concord Road. The PM peak hour for the intersection of Kingston Pike at Campbell Station Road is a LOS E and operates over capacity with a V/C ratio of 1.08, thereby an operation that is unstable and experiencing saturated traffic flows resulting in significant congestion with adverse traffic queues. The Kingston Pike intersection with Concord Road is a LOS D during the peak hours with a capacity ratio exceeding 0.90 indicating traffic conditions becoming unstable.

From the analyses conducted, changes in intersection capacity and delays are minimal for the study intersections, and levels of service did not change significantly from the background traffic conditions. Analyses determined that the proposed site development did not result in any significant changes from the analyses conducted for the background traffic conditions which found that the Kingston Pike intersections with Campbell Station Road and Concord Road may experience a LOS F during the PM peak hour and an E during the AM peak hour, respectively; the site impact increase the average intersection delay less than 6 seconds for either intersection and the increase in the V/C ratio not more than 4-percent. The poor levels of service for the Kingston Pike intersections with Campbell Station Road and Concord Road would occur regardless of the proposed development.

The proposed site does not have a significant impact on the adjacent road network as traffic projections and intersection analyses found little impact resulting from the proposed development. This impact is minimized with the proposed signalized accesses available to the site thereby affectively distributing the trips generated by the mixed-use development. The proposed development is a lower trip generator than the zoned property which could possibly develop an approximate 295,000 square feet of retail uses. The comparison of the trip generation found the proposed site reduces the trip generation potential as compared to the possible development with the current zoning. With the same pass-by rate of 20-percent applied to the trip generation of a 295,000 square foot center, the daily trips generated may be 3,300 fewer daily trips and 390 fewer PM peak hour trips with the proposed mixed commercial and residential development. An additional approximate 75 trips might be generated during the AM peak hour with the

mixed-use commercial and residential site but is not significant as it is managed with numerous accesses to the adjacent street network.

RECOMMENDATIONS

The analyses conducted and the review of the traffic volumes identified the following recommendations:

Minimize landscaping, using low growing vegetation, and signing at the planned site accesses.

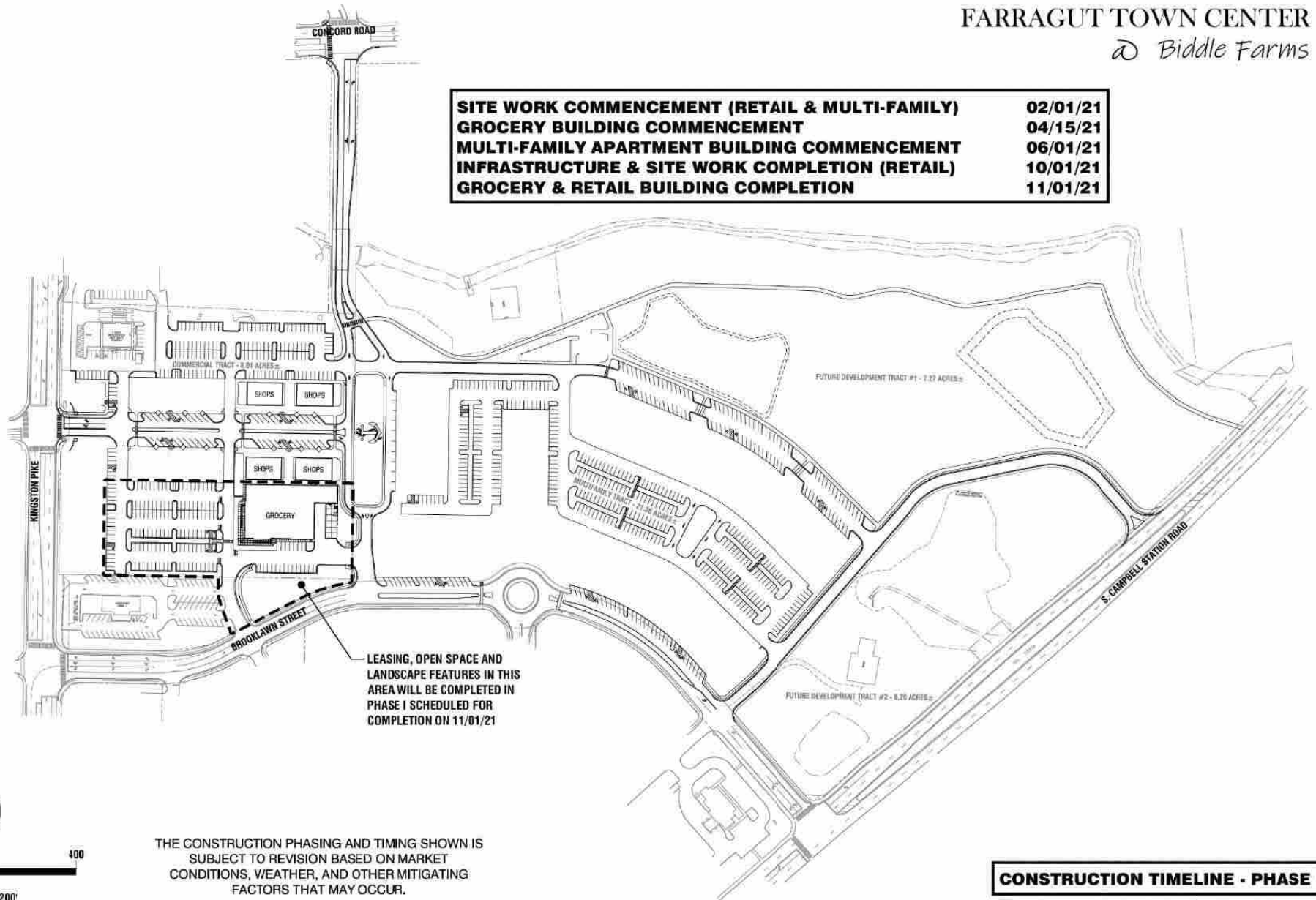
Intersection design should conform to the recommended standards and practices of the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, Tennessee Department of Transportation (TDOT), and the Town of Farragut. The proposed site access for the site was found to operate at acceptable levels of service; however, the adjacent Kingston Pike intersections with Campbell Station Road and Concord Road may experience lower and unacceptable levels of service as the background traffic will have a significant impact on the intersections' capacities. Background left-turn volumes exceed 300vph for the northbound, southbound, and eastbound approaches of the Kingston Pike and Campbell Station Road intersection thereby requiring double left-turn lanes. Double left-turn lanes for the Kingston Pike and Campbell Station Road intersection would be very difficult with the current development of the intersection corners. The provision of these double left-turn lanes would require several design exceptions if they were to be considered by the Town of Farragut, minimizing any right-of-way required.

Mitigation of background traffic impacts for the of Kingston Pike intersection with Concord Road is an additional northbound right-turn lane. The mitigation of both Kingston Pike intersections with Campbell Station Road and Concord Road would return level of service and capacity back to that currently experienced for the 2020 traffic conditions. The development of the Biddle Farms property did not determine any required mitigation as its impacts were not significant and acceptable levels of service provided for the accesses to the site.

FARRAGUT TOWN CENTER

Biddle Farms

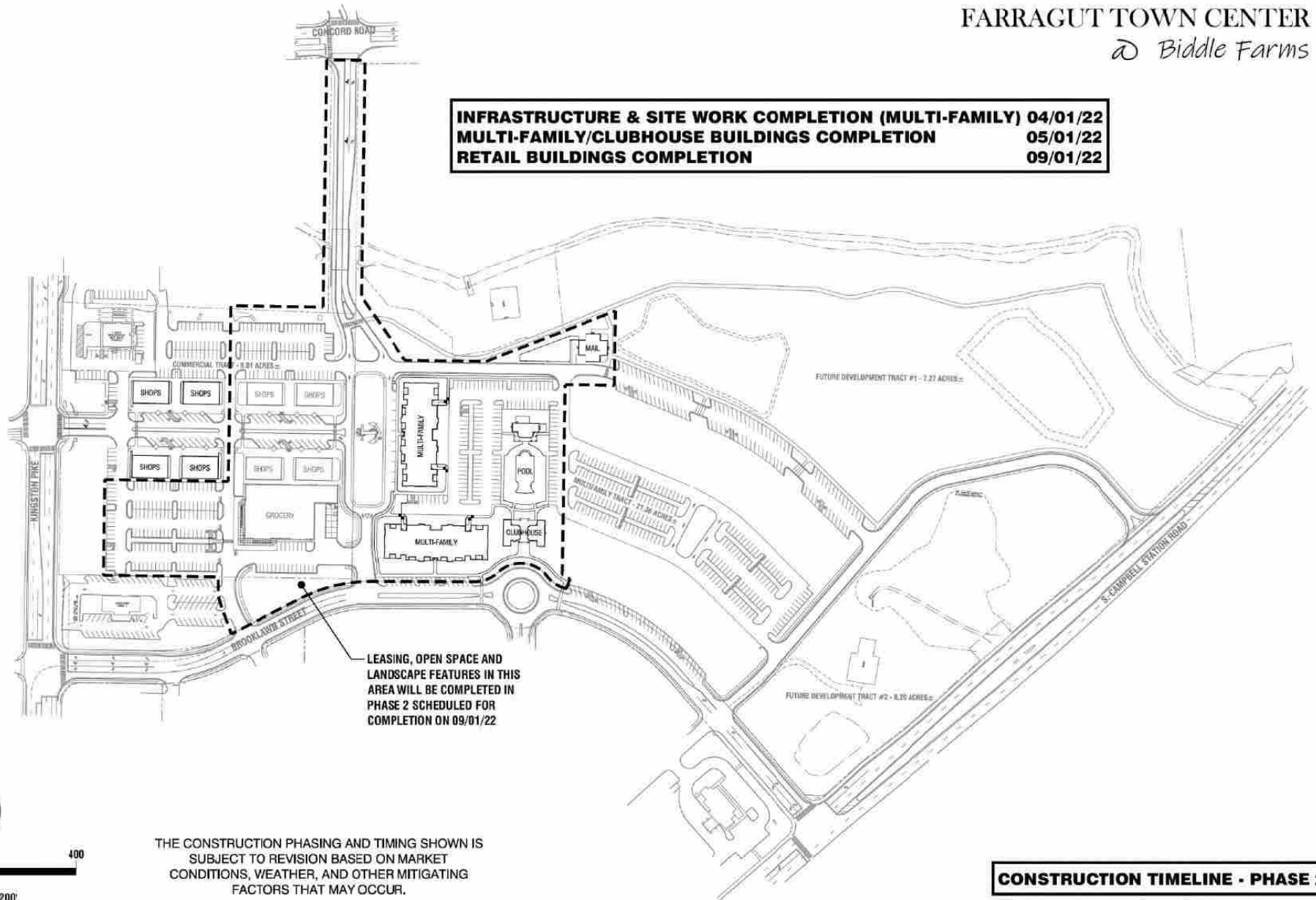
SITE WORK COMMENCEMENT (RETAIL & MULTI-FAMILY)	02/01/21
GROCERY BUILDING COMMENCEMENT	04/15/21
MULTI-FAMILY APARTMENT BUILDING COMMENCEMENT	06/01/21
INFRASTRUCTURE & SITE WORK COMPLETION (RETAIL)	10/01/21
GROCERY & RETAIL BUILDING COMPLETION	11/01/21



FARRAGUT TOWN CENTER

Biddle Farms

INFRASTRUCTURE & SITE WORK COMPLETION (MULTI-FAMILY)	04/01/22
MULTI-FAMILY/CLUBHOUSE BUILDINGS COMPLETION	05/01/22
RETAIL BUILDINGS COMPLETION	09/01/22



FARRAGUT TOWN CENTER

Biddle Farms

MULTI-FAMILY BUILDING COMPLETION	04/01/23
RETAIL BUILDING COMPLETION	06/01/23
ALL OPEN SPACE AND LANDSCAPING FEATURES COMPLETE	06/01/23

